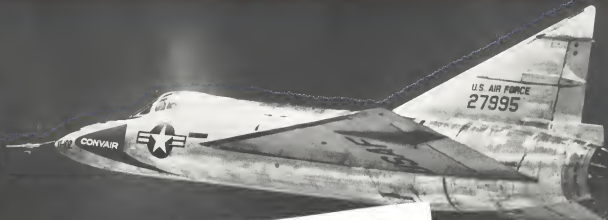


AVIATION WEEK

JUNE 28, 1954

50 CENTS

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Making all-weather supersonic flight a practical reality

THAT's exactly what the ship you see here does. She's the F-102, the Air Force's new all-weather interceptor.

Playing an important role in the F-102's all-weather supersonic performance is her yaw damper and pilot assist control system—made by Honeywell and chosen by Convair engineers after exacting tests.

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Each of these two developments is an outstanding achievement in its own right. But the whole is greater than the sum of its parts, and the combination of the HY-V/L Pump with the LO-2/c Turbine has resulted in a very remarkably advanced Turbine-driven Fuel Pump. There are some particularly effective applications for systems concerned with Primary Pumping Phases for Missiles.

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RESEARCH REPORT

B.F. Goodrich

FIRST IN RUBBER



Boeing B-52 lands on strongest high-speed tire yet developed

THE B-52 heavy bomber has a gross weight of over 350,000 pounds. To land it at high speeds, the Air Force needed a tire that could take terrific impacts and heat. A tire that greatly exceeds B-52 requirements and could take 50 landings at 200 mph on the dry-as-a-bone runways of the world. It was one of the toughest tires ever set for an airplane run.

B. F. Goodrich engineers solved the assignment. Using new techniques and rubber compounds, they came up with the largest capacity high-speed tire yet developed. It not only passed the "50

landings" test but was good for 100 more. And it passed automatic load-capacity dynamometer tests at low speeds. Can spare for a post-mortem, it revealed no signs of failure. Result: the new BFG high speed tire was officially approved, is now being made for B-52's.

In addition, B. F. Goodrich wheels and tires for the B-52's were chosen as standard equipment.

The development of this new B. F. Goodrich high-speed tire is typical of other BFG engineering accomplishments. The first low-pressure airplane tire—the first high-pressure tire—and

the first high-pressure wheelless tire were all B. F. Goodrich developments.

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Aviation Week

JUNE 28, 1954

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NEWS DIGEST

Domestic

Cowen's XF-105 Popothen was being fitted last week with spinner and new dampers apparently in its first test flight, was expected only in July (American Week June 21, p. 36). After initial flight tests at Moffett Field, Calif., the vertical-takeoff fighter will be tested at Beale Field, in southern Nevada Air Station near San Diego.

Prototype C-119, Lockheed Aircraft Corp.'s turboprop-powered USAF cargo transport, has moved onto the main runway at March Air Force Base and is expected to make its first flight in August. Lockheed's Meritts (Ga.) Division will handle production of the C-119.

Gen. Edwin W. Rindings, chief of the Air Materiel Command at Dayton, has been awarded the Soldier's Medal for heroism in taking his life in saving a downed pilot from a burning YD-17 jet in 1945 at Wright-Patterson AFB.

Robt. Aeronaut Corp., Chula Vista, Calif., has received new orders for power packages and other aircraft components totaling \$23,500,000 from Boeing Airplane Co., Lockheed Aircraft Corp. and Fairchild Republic & Airplane Corp. New Robt. Aeronaut building, \$118 million.

Brig. Gen. George F. Smith, vice commander of the Western Air Defense Force, will become chief of staff of the Air Defense Command at Fort Worth, Texas, Colorado Springs, in July.

Four American World Airways and Radio Corporation of America have been placed completely into custody at USAF's Aircraft Test Center at Fort Worth AFB, Texas, and are being inspected approximately 1,200 engines per month. FAA expects the facility under an Air Research and Development Command contract, with RCA in the subcontract.

Brig. Gen. William F. Nichols, chief of operations at NATO headquarters in France, was named with this unit as Air Defense Command's 3rd Air Division at Travis AFB, Calif. He will replace Brig. Gen. Remond W. Naynes, who will succeed Brig. Gen. T. Allen Bennett as commander of the 24th Air Division at McDowell Field, Wash.

Less 1.5 seconds and approach complex has been certified for Convair 440, following six hours of tests by Civil Aeronautics Administration in



Turboprop C-131C Goes to 30,000 Ft.

The new Convair TC-131C, America's first military turbo-prop transport in service, was shown in a test flight on June 21, 1955. The plane reached an altitude of 30,000 ft., setting a new record for 100-ton transports, according to Convair's Ft. Worth Division. The USAF TC-131C is a modified 540-hp with two Allison YT26-A-6s.

a Bonnell Airways 540 at gross weights up to 47,000 lb.

Flight Refueling, Inc., has started field operations of its new production plant and test laboratories adjacent to Belvoir's Friendship International Airport (American Week Nov. 13, 1953, p. 10).

Supra B-26 will be put up for sale by Air Materiel Command, soon at Davis-Monthan AFB, Ariz. The biplane, constructed approximately 1918, was scheduled for limited operations of engine and some structural and other equipment, after which the bomber would be sold to the B-26 down for scrap.

Fairchild Republic & Airplane Corp. plans to build new facilities for its Aircraft Division at San Antonio (The) Municipal Airport.

Headquarters for National Advisory Committee for Aeronautics last week was moved to 1712 H St., N.W., Washington, D.C.

New Lancaster, a re-engineered Lockheed B-58, is being converted from Los Angeles to Miami in 9 hr 15 min—excluding a 30-min refueling stop.

First USAF base to convert to the new federal accounting system will be Wright Air Force Base at Dayton, Ohio, Air Materiel Command has reported.

Financial

Ryan Aeronautical Co., San Diego, reports net profit of \$1,054,088 for the

first half of 1954, compared with \$702,431 for the first six months of 1953. Gross income of the company increased from \$21,190,821 to \$25,540,185.

Texas Caribbean Airways has ordered a new aircraft on Class A shares plus 1% on Class A and B stock, payable July 15 to holders of record for 1954.

International

Swissair Comair 240 crashed in the English Channel June 19 after it was forced down by engine trouble while in route from London. Six of nine persons aboard the plane were injured, others still were missing at midnight.

New 100-million agreement has been signed by the U.S. Foreign Operations Administration to finance British production of aircraft to be used by the Royal Air Force in carrying out NATO commitments. Plans to be ordered: English Electric Canberra, Vickers Valiant, Supermarine Swift and Hawker Hunter.

Altair guided missile developed by Canada during the past three years in conjunction with the Canadian Defense Research Board is being put into production at the company's Montreal plant. Altair has been tested from Convair-built F-86s and Avro CF-100s.

Hugonot Sales Verdon technology delivered 5,000 lb thrust during a 30-sec test run, according to reports from France.

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SILVER-PAINTED Douglas A4D Skyhawk, single-place Navy fighter, is shown at work position and early operational use (Aviation Week, June 24, p. 14). Capable of carrying 4 bombs, using other weapons, it has a single Wright J65 W-3 jet.

Tiny Douglas A4D Packs Big Wallop

ED REPPESMANN (photo right), chief engineer of Douglas ED Segundo Division, is responsible for A4D's functional layout and weight saving. South leader the crew the U.S. navy. Short wings the unit engine complex folding mechanism usually necessary on carrier planes. Wingspan is approximately 27 ft.





North Central Airlines



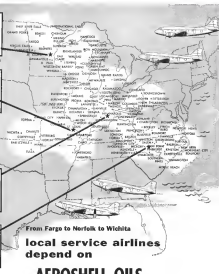
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WHO'S WHERE

In the Front Office

Carl J. Lamb is new president of Avionics Corporation of Texas, succeeding James E. Jelen, who has been elected head chairman of the Houston company.

Changes

Dr. Rodolfo M. Seils, former manager of Avionics, Phoenix Corp.'s Development Division, has been moved up to engineering director of the Chicago division manufacturing.

Stanley W. Hensley has been appointed general manager of Avionics Corp.'s new general Product Division at San Antonio, Texas.

G. E. Theobald has become assistant general sales manager for Texas World Air, Inc. Promoted to sales director, J. H. Fisher, a world executive, R. E. Robinson, president, M. E. C. Kellips, vice-president.

James R. Conway has been promoted by General to program director of one of the division's guided missile projects.

George S. Duff and Max Thomas are joint directors of Flyer-Tek Systems, Inc., new General and Chance Division, with Duff taking charge of engine activities and Thomas directing the systems section.

Other changes: A. V. Paine, assistant general manager of light operations; E. W. Dunn, sales relations manager; Earl Carpenter, manager of personnel administration; Ralph Stein, regional manager at San Antonio.

David A. Webster has become manager of Lockheed Aircraft Corp.'s engineering test laboratory at Marietta, Ga.

Leona Partridge has been appointed to United Aircraft Corp.'s Pratt & Whitney Aircraft Division as manager of the airport development East Hartford, Conn.

J. E. Callahan has joined the Guaranty Corp., Los Angeles as staff assistant to the vice president in charge of the company's air maintenance, Aero Equipment, Air Division and Aero Sales Engineering.

Arthur E. Peltzer has become manager of operations engineering for aerospace operations at Lockheed Aircraft Co., Denver.

John W. Larson, former chief engineer for General, has joined Chance, Veight Aircraft Co., Dallas, as chief assistant to the chief engineer.

Honors and Elections

Manly Frels, president of Republic Airline Corp., has been elected by the Society of Changes to "aeroshell and efficient service" in the nation. He has received an honorary degree of Doctor of Engineering from Clarkson College, awarded for service in the aircraft industry.

Raymond G. Fendley, aerospace engineer at Cook Electronics Co.'s research laboratory has received a Navy contribution civilian award for "aeroshell and efficient service" in the aircraft industry.

David Deane, public relations director and treasurer of Cook Aircraft, has been elected chairman of the Southwest Air's public relations advisory committee.

INDUSTRY OBSERVER

■ Navy is working on water-cooled ducts for aircraft engines as a result of problems encountered in operating jet aircraft fitted with afterburners from its aircraft, says James H. Smith, Assistant Secretary of the Navy for Air.

■ Douglas test pilot Bob Rahn disclosed last week that on the aerial response flight of the first production Douglas F4D Skyraider (Aviation Week June 14, p. 5) the aircraft reached a speed of 450 mph before he checked out the end of the airport property on takeoff. Rahn said he was aboard in 1,000 ft using the afterburner on the Pratt & Whitney J57 engine. The flight from Los Angeles International Airport to Edwards AFB was made June 5.

■ Aircraft deliveries to the Navy and Marine Corps in fiscal 1955 are expected to be about 100 more than the delivery total for fiscal 1954. Navy plans to operate 3,940 aircraft in fiscal 1955.

■ Westinghouse J44 engines (initially installed in the XGZT-1 Sea Dart, Coast Guard's helicopter jet fighter, have shown up well during rigorous water and flight tests. Only three corrosion spots were noted on six months of continuous operation. Two sets of J44s were used during this period.

■ Lockheed T-33 jet trainers, fitted with the Martin B-61 Meteorite missile practice rocket, are being used at the USAF Military Test Center, Patrick AFB, Fla., to give applicants a practical experience in handling the Meteorite. The T-33s can be used over again in place of the one that Meteorite. Lockheed B-61A practice drone planes at the test center are equipped with emergency ejection seats to catch the system cable-cueing firing modification that holds the jet in place if the plane cannot be cleared by the time they reach the end of the runway.

■ Navy Helicopter Squadron HEC-2, based at Lathrop, N. J., has completed 25,000 hrs of flight as Fleet HUPs. First HUP was delivered about three years ago.

■ Marine Corps is making a \$13,560,000 reserve in guided missile funds for fiscal 1955 over the fiscal 1954 amount in order to purchase 275 Coyote Terrier surface-to-air missiles. Total of 865 missiles only partially will fulfill first-year procurement requirements for Coy Terrier battalions. JPMF, G. A. Lennett, C. Shepherd, Marine Commandant, told senators.

■ USAF is accumulating in rates and spare parts over the beginning of fiscal 1955, including inventories on hand and unliquidated obligations of that date, totals \$12,144,308,696.

■ Navy's program to modernize its jet aircraft operating bases, which was started in 1951, will be approximately 75% completed by the end of fiscal 1955. Naval Air Station establishment will consist of 93 stations—32 complete and 19 aviation—by the end of fiscal 1955.

■ Officials in making the F-84F tactical system with the Westinghouse J44 engine, an advanced design which formed an integral part of the aircraft's boost system, have tested the USAF to verify the new conventional Low F-84F adaptation. Westinghouse expects to find other applications for the F-84, which repeatedly has passed all military environmental tests without failure.

■ Navy design seat for Alliance T40 designed for vertical operation to General instead of to Lockheed. The new power-developing fuselage in which canopy makes first low vertical flight tests with the VTO system.

■ Douglas B-66, USAF version of the Navy's AMB, was scheduled for its first flight last week.

■ USAF has announced new high-rate production and been able to get nearly all major contractors on a single shift, 8 1/2 operations, Air Force Secretary Harold E. Talbot reports. "The 5-1/2 shift gives us a true mobilization base," he says, "because any factory placed for a single shift operation has an immediate capacity for accelerated operation to 150% of its normal capacity."

AVIATION WEEK

National Preparing New Bid for Colonial

- Board endorses NAL's second merger effort.
- EAL faces investigation of alleged CAI control.

By Richard Balesine

National Airlines proposed last week to renegotiate a merger agreement with Colonial Airlines, 36 months after Colonial stockholders turned down NAL's original consolidation proposal in favor of an Eastern Air Lines bid. Civil Aeronautics Board ruled June 17 that a NAL-CAI merger "would be consistent with the public interest" and ordered a "full investigation" of Eastern's alleged previous control of Colonial.

National president G. T. Baker, who told American Wire earlier in an exclusive interview that the airline industry should start thinking in terms of operating units to fit the nation, had the comment on the CAB merger ruling.

"The wheels of justice are moving in the right direction. This move is in the public interest."

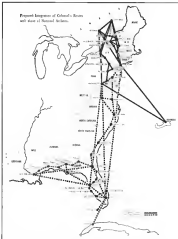
Presidential Veto—It was the federal control unit again when President Eisenhower vetoed June 17 the Board-approved EAL-CAI merger (ENR 7/7 Aviation Week May 3, p. 51). The Board was aware of Eastern's control at the time but felt it should not hamper a merger since the move would eliminate Colonial from 55% 100 percent subsidy.

In its recent action, CAB ruled that EAL's request for dismissal of a show cause order to determine the extent of its control over Colonial "is insufficient to warrant the continuation of the investigation without a full hearing."

"As to the attempted showing that Eastern does not exert control of Colonial," the Board said, "it appears from our review that there are sufficient facts and inferences to warrant a full investigation."

"It is clear that Eastern has not made such a convincing showing in its two-year case would result in a dismissal of the show-cause order at the very threshold of the proceeding."

Price Fixing—The Board decided that, without such an investigation, it could not consider the case that should allow "a



If merger goes through, NAL would extend south to Miami, east to Bermuda.

board and Colonial to begin negotiations immediately. CAB points out that as NAL-CAI merger would be approved "only if it were based upon a fair and reasonable consideration."

In that connection, the Board ruled that it would have the benefit of such a merger to the decision of the airline and would not grant National's request that CAB determine a fair and reasonable consideration for Colonial's assets.

"We wish to make it clear however," the Board stated, "that our action here does not constitute a determination that a future acquisition agreement be-

tween Eastern and Colonial would necessarily be inconsistent with the public interest of Eastern, prior to entering into such an acquisition agreement, after shown to have clearly defined stock of control of Colonial."

CAB pointed out that EAL has not "satisfactorily demonstrated" that it has transferred its control of Colonial. Until that time, "we can express no opinion concerning the possibility of Board approval of a future Eastern-Colonial acquisition agreement," CAB said.

EAL Questioned—National has been accused from the beginning of the con-

spiracy that Eastern held illegal control of Colonial.

In a petition of quo warranto filed with the Board in April (Aviation Week May 3, p. 78), NAL said this was "an abusive situation that no owner who flows Eastern can successfully consummate a consolidation with Colonial."

National told CAB there is no immediate risk that Eastern and Colonial would attempt to negotiate a new merger agreement. For that reason, NAL asked the Board to question Eastern from any further transactions with CAB.

CAB pointed out that "National's petition does not allege any facts showing that such negotiations have been conducted or are about to be conducted or that Colonial is about to solicit a bid from Eastern."

NAL View—In Colonial's answer to NAL's quo warranto petition, the airline denied that CAB or its management is under Eastern's domination. The Board found that "Eastern's motion to dismiss the quo warranto proceeding and the compliance attorney's answer demonstrate that less than 10% stock ownership of Colonial remains in persons found to be associated with Eastern. From such unimportant facts, the Board can readily make a determination without further hearing."

NAL has claimed that amount of stock is sufficient for control of Colonial. Squared Line, Eastern CAB president, held control of Colonial for eight years, says National, by owning less than 9% of its stock.

"National's charge that the effect of Eastern's illegal control activities will persist and is an effective barrier that no owner other than Eastern can successfully consummate a consolidation with Colonial is without foundation and is contrary to the record," the Board found.

Eastern Claims—EAL has charged that National's real purpose is to eliminate Eastern in order to acquire Colonial "on its own terms at only a fraction of the fair and reasonable price which Eastern had offered."

When it recommended that the President approve an Eastern-Colonial merger, CAB reasoned that the combination would provide a "substantial and prompt integration of the two systems in personnel, facilities and in aircraft scheduling and would provide a greater volume of single-carrier service."

"It would cause less mileage diversion from National than would be suffered by Eastern if National and Colonial merged," the Board said.

Basic Pattern—If the proposed NAL-Colonial merger were accomplished, National would be adding 1,338 mi.—not including CAF's New York-Bermuda route—to its present 1,021 mi. routes. NAL's routes would be extended



NAL's DC-7 fleet is doing well in market and facilities, president Baker notes.



NAL's big Miami base typifies airline's importance in Florida city's economy.



MIAMI CLIMATE shows National to handle outdoor maintenance on a new-titled item.

north from Washington, D. C., and New York to Montreal and Ottawa, Canada, and east to Bermuda.

Integration of the routes of the two airlines would make available one-carrier service to passengers moving between Canada and Cuba. National's southern coast point. A further economic benefit could be the elimination of NAL's problem of several thousand in traffic.

Seasonal Routes—It is the seasonal effect that prompted National to promote its "ad hoc" routes on a jockey-bank budget plan to speak interest in a Florida winter during the spring and summer months. National's biggest business at present comes from the fall

and winter vacations bound for Florida from New York and Washington.

Korean Solution—In a day when every airline is seeking higher fares to improve revenues, Baker believes the answer lies in reducing or removing the federal fare so transportation. He also would appear of removing the shipping dividend and double fare plans.

"Answer is here to stay," he says. "We think we could raise our fares a 30% if any increase in first-class fares would not result in a loss of business."

National now operates better than 60% overhead on its routes and can probably well increase that in the near

before, according to Baker. NAL was one of the first to get Douglas DC-7s into coach service, putting the transport on the most lucrative segment of its route—New York to Miami via Norfolk (Aviation Week, May 17, p. 187). Early rumors on the DC-7 coach indicate this move will prove a good business venture.

Only difference between Lockheed and transit DC-7 flights are meals and air service. On the coach, National serves only meals.

High Load Factor—Baker says both services are doing well. Load factors on the DC-7 are high, bettering out his production last month that the new coach service would attract more "would-be" Eastern passengers. EAL, National's major competitor, is flying Lockheed Super Constellation coach service.

NAL is flying four DC-7s at present, but "we could use more," Baker points out.

Each of the 49 passengers carried in both NAL's first-class and transit DC-7s get the mid-seat treatment. A plethoric seat is rolled out to the landing ramp of each arriving and departing plane. This, Baker says, has been known placed in the cabin, given until NAL considers its "coach."

Jet Nuts—Baker believes jet transports are quite a few years away for U. S. domestic traffic, but looks with trust at Capital's order the month for Vickers' jet-propelled Viscount (Aviation Week, June 18, p. 16). National will be using the Viscount under its inter-branch agreement with Capital at Washington-Miami flight.

"The sole factor in operation of jet transports" will deter quick conversion to jets, he says. "A whole new concept of airport handling will be needed with the introduction of jet transports. Airports will have to be located further away from cities than they are presently."

Aviation TV—At present, National is concerned about providing its own television station. However, it will be held before Federal Communications Commission last week in Washington. The firm wants to operate a channel in Miami.

"There are about 10,000 people employed in the aviation industry in the Miami area," Baker says. "Aviation is an industry in this area a second only to tourism. We feel that we can offer a real public service through the use of TV. We hope FCC will feel the same way about it."

Engagement—Baker has headed NAL since the Lockheed parent, which in 1957 from a partnership, in 1958, of which he was a founding member. Until recent years, the aircraft policies were decided entirely by the Lockheed. Today Lockheed restricts strong leadership of the company, but

responsibility for policy making is spread among top management executives.

In NAL's pantheon are the Aviation Building in Miami, Baker and his executive team of people daily in discussion developments and make decisions. This is the idea to save time by eliminating staff conferences throughout the rest of the day.

Recently National converted one of its Lockheed Lodestars into an executive aircraft. Baker already has made one top secret NAL's system, meeting and talking with his employees. He expects to spend more time in that project in the belief that only through such visits can his management expect to keep fully informed of the thinking and problems of NAL employees.

Hughes Blowup

• Jordan quits in second top workload within year.

• Avionics firm expects no widespread shakeup.

Los Angeles—Another top management shakeup rocked Hughes Aircraft Co. last week for the second time within a year.

Reports from inside the Hughes organization and William C. Jordan, new general executive and vice president of the huge aviation concern, had indicated the shakeup.

Jordan, who left Avionics Wright "last week," said he was to come from Hughes Aircraft to confirm the report. Jordan, who was formerly president of General Wright and Wright Avionics Corp., was appointed last October to replace Gen. Harold L. Jordan, who left the company after a dispute with its vice president emeritus (Aviation Week, Dec. 10, p. 35).

The previous management blowup at Hughes resulted in the departure of a number of top officials including their first vice president, Gen. George C. Thornton, Jr. Simon Forman and Dr. Dean Woodbridge.

A company source says a similar top echelon workload is not expected to follow the Jordan resignation. Hughes is expected to name some a top echelon industrialist to replace his departing senior manager.

Growing Competition—The latest development at the \$100-million-a-year avionics firm comes when the Radio-Woodbridge Corp., formed by the two former Hughes vice presidents, is opening rapidly into the same field occupied by the Hughes company. Latest reports it soon will enter the engine market.

Gen. George is a director of the Radio-Woodbridge organization, which is headed by Thompson Products, Inc., at Cleveland.

USAF Comment—The Air Force has definitely been watching closely the latest management blowup at Hughes. At the time of the man walked last September, Secretary of the Air Force Harold T. Hensley flew to Los Angeles to interview in the dispute.

He made it apparent at that time that the Air Force was concerned with the effect management changes might have on the Hughes production facilities. The new system was set up for the F-84D, F-86D and F-100, as well as an increasing emphasis on interceptors such as the P-100. The Hughes plant at Tucson, Ariz., is turning out F-100s at a rate of 100 a month. The company also holds contracts for far control system for Navy aircraft.

One report said it was at the insistence of the Air Force that Jordan was assigned general management of the Hughes Calver City plant after Gen. George resigned.

Hughes Budget—It has been so secret at the Air Force that USAF has been concerned about all its own current work at the Hughes plant. Since Air Force support has been given to the new Radio-Woodbridge organization and several defense companies have been looking for second orders for their new contract system.

Jordan, who left General Wright in 1949, is listed as director of a number of smaller firms in the aircraft field. He declined to comment on his plans for the future.

\$55-Million NACA Budget Approved

Congress has approved a \$55,000,000 budget for National Advisory Committee for Aeronautics fiscal 1955.

This is \$5,119,000 less than NACA's fiscal 1954 budget of \$60,119,000. For salaries and expenses, \$10 million was approved, the same amount as for fiscal 1954. Gen. George C. Thornton requested \$13 million.

For construction and equipment, Congress approved \$5,620,000 requested by NACA, making a \$27,000 increase in total appropriations. The money is to be used for:

- Ames Laboratory, a new test section for an existing wind tunnel to increase high-speed capabilities.
- Langley Laboratory, a new facility for studies on landing and takeoff characteristics of high-speed airplanes.
- Lewis Laboratory, new rocket engine test facilities, alterations on an existing wind tunnel to increase its speed range.
- Latest reports it soon will enter the engine research facilities.



MAY DAY DISPLAY of Red might was highlighted by the top-top bomber, comparable in size to Boeing's B-52. Fighters are MIG-17s.

Russia Parades Airpower as 'Big Stick'

Russian propaganda aimed at promoting the power of the Red Air Force was seen in a new book with the Soviet Air Day display (June 10 at Moscow's Tushino Airport).

There is general agreement that the display showcased current Russian tactics policy of trying to impose the Western World with Red military capabilities.

The Propaganda—Tended to coincide with the annual airpower demonstration was.

An article by Artem Mikoyan, famed co-designer of the MIG-15, praising the display and praising the appearance of a supersonic jet plane of revolutionary design.

A Moscow radio news item that a Russian jet airplane had reached a speed of 1,875 mph, about Mach 2.5 (Current recognized speed mark of Mach 2.5 was set by USAF Maj. Charles Yeager last December in a Bell X-1A research plane).

A Moscow radio announcement that the world's first flying wing glider would be demonstrated at the Tushino display.

Official Russian release of a photograph of the four jet bomber that made its previous appearance over Red Square on May 14 (Aviation Week, May 20, p. 14). Largest of the plane points to show high altitude operations over the region, but built in some good locations.

was no mention of either a new bomber or Mikoyan's "flying machine."

MIG-15—Military observers were impressed with a simulated landing of a MiG-15 on a runway, according to the press reports.

Thirty-three giant helicopters landed light and medium artillery, guns, weapons stores and troops under a cover of new fighters assigned as MIG-17s for the reports.

Moscow Radio said the flying wing glider was towed over the field and after release it began to "fly" up its own wings like a "fish." "Technical observers generally agree that the chief value of an aircraft is as an area warhead carrier."

Photo-Interpretation—Newly released photograph of the Red bomber seen in the May Day display reveals its design was strong for altitude operation at long range. For that they chose a large span wing of fully large wing for long range and the accompanying light, rapid of the bomber, a size which would 150 ft.

Leading edge of the wing changes sweep angle at about the mid-span point to a sharply increased angle indicated around the fuselage section at the forward location. Trailing edge of the wing also changes in sweep angle at a point located just outboard of the wings.

Such a reveal could have been detected by Russian mobility to build this wing at large span, forcing them to use a fresh thick wing section and to sweep the wing to meet its critical Mach number.

Engine Design—Powerplants of the bomber have been estimated at a thrust of about 15,000 lb. (Aviation Week, May 14, p. 13). Fuel tank due to cover the Russian needed that figure is in the case of the aircraft, which scale out at between four and five feet in diameter.

They are simple paint of the bomber section that were the sections at right angles.

It is entirely possible that the engine at that bomber are either ducted fans or bypass engines, all indications of the installation point to such a type, as does the application is a bomber where long range and good fuel economy are required as permanent considerations.

This does not rule out a conventional radiator engine of large diameter, but the location, shape and size of the units point to a more sophisticated powerplant.

Estimated span of 150 ft. puts the new Russian bomber in a class with the B-52 of 165 ft. span. Other useful dimensions of the Red plane include diameter, approximately 11 ft., horizontal tail span, about 55 ft.

Top performance at the wingspan may be considered, but there is a chance that they are actually more balanced to reduce the chance of failure on the wing.

present an insurmountable problem for the tactical squadron. Prior to turning on the Long Range Observer Range over here, first flight of the Meteor took place at Holloman Air Force Base, N. M., where they were instructed by the rest of the wing. The mission was flown in eight flights and ended to day within range limits.

Presently, sixty generations similar to those taken here to protect U.S. ships along the Florida coast from enemy missiles will be followed in Europe. These include:

- An armed chase plane which can shoot down missiles if control is lost
- Ground-controlled radio elements which can destroy the missile in the air if it shows off course
- Self-contained "survive" element which will cause the missile to destroy itself if radio contact is lost for more than a few seconds

Metro, similar in appearance to a conventional aircraft, has a wingspan of 28.6 ft and a length of 39.5 ft. Powered by a modified Allison J31 turbojet engine (Aviation Week June 21, p. 11), it is launched from a 3,000 ft length launcher with the aid of a Ramjet (rocket-motored takeoff) unit.

► **Flight Showing.**—Due to the rapid advance of the missile, its modified 117 missiles feature designed to reduce costs.

"Less critical materials are utilized, inspection techniques are not quite as close, (inspections are not required after the work) run on the test stand, and the number of accessories is reduced considerably," Allison explains.

First public demonstration of a B-61 firing was before audiences of the Avionics Warfare Area (see p. 16 of Cape Canaveral, the auxiliary Air Force Base 35 mi from Patrick AFB).

The platform launcher squadrons will be completely mobile in tactical use, Gen. Richardson reports. Depending from tracks, a squadron could set up for firing within 96 minutes, he says.

► **Range Extension.**—Range of the Metro is greater than the present stage of its direct ground-controlled situation. The present no problem at Cape Canaveral where control may be passed back to downrange radar stations, but requires a slightly different technique for tactical use.

Range could be extended by placing the firing base in a rear area away a part or other logistic supply source and placing the control area near the front, perhaps 100 mi away.

Although the missile is an autopilot for some seconds after launching before the ground controller takes over, the B-61 at present does not have an auto pilot system which could be set to drive it into the target after it passes beyond the range of the ground controller.

► **Other Techniques.**—It would be pos-

sible, however, for an accompanying "mother" plane to take over control of the chase once it was necessary and also targets many radar beyond control range.

Newman also saw a demonstration of how the night work. Director planes were used to fly both QJ-80 and a QJ-17 during night-control flights, taking over the radar control after the planes had been airborne under the direction of a ground station. Similar techniques could be used to direct a missile to its target, a further extension of the tactic used during the



NEW NAVY TRAINER — A Beech T-34, also built by USAF and several foreign air forces

T-34 Wins Navy Trainer Contract

Beech Aircraft Corp. has won Navy's primary trainer competition with its T-34. The prize is an order for several hundred Navy versions of the Mentor, differing only in minor details from civilian models being built for USAF.

In New York, financial circles report the initial T-34 order will total \$9 million.

Final settlement of the competition, now almost a year old, followed submission of new cost proposals by Beech and Texaco Aircraft Corp., including provision of a year's parts (Aviation Week Apr. 19, p. 16). At that time, Ryan Aeronautical Co. stood in to have its trainer evaluated at Pensacola (Fla.) Naval Air Station, dropped out.

► **T-34 Economy.**—Navy's Bureau of Aeronautics says the all-metal light trainer is expected to bring operating economies as well as faster primary training accidents among student pilots.

Certainly all of the lightweight trainer data submitted had a good deal of merit," says Rear Adm. Apollo S. Smith, BuAer chief.

"Furthermore, the three planes actually tested by the training command were excellent," continues Smith. "The T-34 was picked primarily because it cost less, and we left over some possible use should be elicited."

Kosmo was in which AT-6 spitter aircraft directed light-bomber strikes into close support targets.

Although the Beech can dash onto a target at supersonic speeds, it is subsonic in level flight.

Buick's 2,000th J35

Buick Motor Division of General Motors Corp. has delivered the 2,000th Wright R-5 turbojet built under a \$25 million USAF contract. The September is scheduled at Buick's Lyons, Ill., plant.



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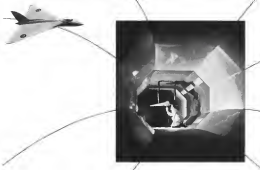
This new EEMCO motor was designed for a wide variety of uses where a light, compact unit with unusually long life is required. It is suited for large quantity, low cost production. All cast components are either die, investment, or molded.

The basic design is extremely flexible. Speed can be varied by changes in winding and/or laminar stack length. Wound for 26 volt D.C., it can be wound for either 110 volt A.C. or D.C.

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Storm in a Test Tube



The first test flight of every newly-designed Avro aircraft is made in a laboratory wind tunnel. The air, many times faster than a hurricane, but far purer, is exact model of the atmosphere. A designer believes, examining the forms in the model, to be sure of one source, stress designers have the new design will perform in actual flight. In addition, great care is now taken so that complete full-scale replicas of the aircraft systems can be tested and specimen components isolated to breaking point before flying trials begin. Inevitable bugs are thus exposed and later modifications needed. Shown in the wind tunnel of our picture is a model of the Avro Vulcan, the world's first four Delta Bomber. This is the aircraft whose revolutionary new features have led to the world's largest, high altitude flight with heavy loads in zero zero, speeds. The success of the modern new design is a fair tribute to the pioneering genius of the Avro team, to the thinking of the designers and technicians, to the painstaking care of the model makers and those who use the models, to the knowledge of the production engineers and the skill and realisation of the men and women in the workshops, to the research engineers, specialists and test jobs. Thanks to these and a congenial and wide management, the Avro Vulcan is now in super priority production for the Royal Air Force.

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Why AF Is Slashing Obligations

Officials cite F-84F program as example of rushing into production and finding "it is not all we expected."

Detailed testimony of the F84F development production program was offered by top USAF officials to explain current procurement problems to members of the Senate Appropriations Committee.

The discussion was triggered by Sen. Homer Ferguson, chairman of the Sub-committee on Military Appropriations. Ferguson questioned Lee White, Assistant USAF Secretary for Manpower, about the ability of contractors to control USAF fiscal policies are producing combat aircraft before to those of the enemy.

■ F-84F Example—White stressed the answer to your first question is "No." "I think I can go back and give you an example of the F-84F as an illustration of going ahead and deciding we have a plane and spending money and finding out it is not all we expected."

"The F-84F was meant to be an extension of the F-84D. They rushed into production with it and the F-84F didn't work out as quickly as expected so that the system of making ahead had resulted in spending a lot of money, and in probably getting less, because when you have the money in the program you don't like to back out of it."

"The claim in this program was to substitute that delivery of an airplane will overlap with delivery of more modern planes which will soon be available. The experience with this airplane is an example of what happens when a new model is rushed into production."

■ Delivery Overlap—"The original idea

contrast for the F-84F airplane was signed in July 1956. The F-84D was planned into accelerated production at the outbreak of the Korean war due to the urgent need for a fighter bomber with increased performance."

"The Air Force went ahead full scale, spent a lot of money on the F-84F and is now finally getting a production plane. When the money got tied to the F-84F we had to stop with that plane rather than waiting for a better plane. It's delivery of that plane is overlapping with delivery of a more modern plane. We would have gotten it faster if we had gone slower in the beginning."

"We are now making sure that before we get into a plane and get ourselves tied to that plane, we have a plane that will work and will be a good one."

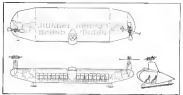
■ Test—Ferguson—Major Gen. Oscar Peltier offered the following comment in response to questioning by Sen. William Knowland of California:

"The F-84F flew in Korea and was a fine airplane. What you are going to get out of the F-84F will be a better airplane. It is not a useless airplane and it is going to get well. It has stopped on time a great deal, due primarily to difficulties with the tail which they are working on."

Sen. Ferguson asked Gen. Peltier if his comment on the F-84F tail difficulties was unheeded. Peltier replied:

"Yes, sir. I think it is well known and has been written up in various sources."

Sen. Ferguson: "We usually get no



Inside the New Bell Copter

This diagram details the powerplant and seat arrangement placed for the new Bell helicopter. When there is no need for 40 passengers, seats can be

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personal information from the press.

While inserted in the magazine, the following statement is the official USAF letter of the F-5H program.

The F-5H program was initiated in mid 1959 after Republic Aviation had submitted proposals to increase the performance of the F-5H by changing to a swept wing and using an increased thrust engine. Because of the Korean requirement, which 1 month earlier, in the fall of 1950 the first procurement of several hundred planes from F-5H hands was ordered on the basis of performance design.

No prototype had been tested and in fact, design and production engineering had yet to be completed. Quantitative measurement of the plane was made at the early stage of its development because it was thought that the F-5H was simply a further development of the F-5H, which was already being successfully produced.

The F-5H was to be powered by a

10,000 h.p. engine of British design. The engine had not as yet been completely "debugged," but a prototype was available. The engine was to be produced in quantity by the United States manufacturing to American standards. The British drawings were to be set down only to provide for United States measurements and standards.

Problems Understood—The original production schedule for the plane, prepared in August 1950, called for the first delivery of the production version by the fall of 1951, about a year after the start of production. The first production models were not delivered until the end of 1952, 14 months after the original schedule date.

Production of the great quantity of aircraft was not started until the middle of calendar year 1953. The difficulties involved in the production of the F-5H and its engine had been greatly underestimated at the time the plane and the engine were put into quantity production.

As work proceeded on both the



Converting Readies New Compound Copter

First view of Converting? Model A quadcopter compound copter, built at longer at 200 ft. long, 10 ft. wide, the prototype's important layout. Each is powered by two 100 hp. engines, one at the front and one at the rear. They supply power to the four rotors of the tip of the wing like a helicopter. The single-plane Model A is reported to have been built in 1954. The rotors in the wings (discovered) are for climb. The drive system includes multiple Y-belts and a central axle drive into a fuselage drive shaft. No engine and rotor control cable belts transmit power from the fuselage-mounted shaft to individual rotors. Motor belts (cable) employ a single belt in rotation and control system.



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The production of these spurs required the use of heavy presses, the available capacity of which fell far short of that required for this and other programs. These spurs were to be fabricated in two legs, forgings, rather than monocoque belts and girths as had formerly been the case.

► **First Breakdown:** "The early in July [1951] the composer advised the A.P. Point that it was experiencing difficulty in meeting its contract schedule for both the lighter and semi-serious versions of the new aircraft due, to a second delay, both in the production of song lyrics and in the script of an script. 20% cause

A breakdown of the country's large cut in foreign buying power greatly aggravated this situation. The war had to be waged to enable construction with available tools and facilities. In addition, numerous structural problems arose during the course of production necessitating a large number of minor engineering changes, not only to the engine but to the engine and other components as well. As a result, it was necessary, in September 1951 to revise the schedule for these units.

"At about this same time, the requirements for these aircraft were substantially increased under the AD Force's 141 wing program, and additional procurement was programmed. An additional contract was brought into the picture as a second source producer of the plane. Also, to meet the increased requirements for the engine, a second source producer of the engine was established. The second source contract authorized the same production conditions.

► **Orders Reduced:** "During the past year, most of the design and production difficulties have been resolved and more realistic production schedules have been established. The delays in this program, however, have been so substantial that deliveries of this missile will overlap with deliveries of more modern air planes which will soon be available. Action has already been taken to reduce the number of these airplanes on order."

"The experience with this airplane is a prime example of what happens when a new model is rushed into quantity production. The new production policy of not committing large quantities of airplanes to high rates of production until adequate testing and production experience are accumulated should minimize the occurrence of this type of situation in the future."

FAMOUS NAMES

IN JET ENGINE MANUFACTURE

CONTINENTAL

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Convertiplane vs. Copter

The working group on convertiplane aircraft of AEC has classified convertiplanes by speed and the weight penalty they pay over a well-designed helicopter. Here are the figures:

Type	Normal cruising speed (knots)	Cost weight compared to equivalent helicopter
Helicopter	105-130	100%
Helicopter with fixed wings	130-150	105
Convertiplane with partially extended rotor	160-200	115
Convertiplane with completely extended rotor	240-300	120
Convertiplane with tilting rotor	150-210	120
Convertiplane with tilting fuselage	100-400	125
Convertiplane with rotor in fixed axial	300-400	135
Convertiplane with retractable rotor	400 up	135

Group Asks Convertiplane Subsidy

By Claude G. Wirtz

Government sponsorship of a new national convertiplane has been suggested to the Air Coordinating Committee by the working group on convertible aircraft, headed by Col. William B. Bender, assistant chief of Army transportation.

In its survey of convertiplane configurations the committee has shown limitations of fixed wing planes give the impression that an aircraft is not intended to better flight characteristics than they accept after performance factors, such as loading and takeoff.

"Fixed Factor-Performance," the report states, "is the design factor to govern any development which is given those areas which are regarded as secondary if they exist, as they usually do, some consider is the speed or empty weight of their aircraft."

The committee's report was sent to AEC last week. Its specific recommendations have not been made public but Col. Bender discussed the text of the study at a recent meeting of the American Helicopter Society.

Presenting a series of convertiplane configurations, the first section of the report points out the economic advantages that could result from four types of convertiplanes:

► **Disadvantages**—The committee says the current of manufacturers with large and small fixed wing manufacturers "is in the fact or more, largely the government and the airlines, having to pay the cost of this increased performance with larger airfields, greater size and higher altitudes."

The report says: "This seems to account for the willingness of the helicopter manufacturers on the one hand to accept these principles while the fixed wing manufacturers do not regard them seriously."

"Having maximum costs for larger and larger airfields and traffic facilities is encouraging the practice of engineers for higher speed performance and lifting the public bear the cost."

► **Research**—The committee's conclusions follow an observation that most work done on the convertiplane to date has been along the lines of improving the helicopter, trying to make it more competitive with the airplane in forward flight.

On the other hand, the group reports it could not find much evidence that anyone is trying to apply the convertiplane idea to the airplane, making it more competitive with the helicopter and getting landing requirements.

The only research in this field worthy of note the committee finds, is the effort to reduce the stalling speed of airplanes by use of boundary layer control and large propellers to increase surface area on the wings. It is pointed out that success in these fields may discourage interest in convertiplanes.

Other conclusions in the study are: • There are no major technical obstacles to prevent construction of a convertiplane of the partially extended rotor type. The McDonnell XV-1 is an example of this configuration.

• More basic research must be done before production is possible of a convertiplane with a completely extended rotor and whose fixed wing would provide all the lift in forward flight.

• The convertiplane with a tilting rotor that can be turned into a propeller has technical limitations, but they will be solved in a few years.

• The type in which the rotor would be dropped altogether in forward flight is "irrevocably questionable."

The complete report of the group, including specific recommendations,



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will be controlled by ACC and a civil suit may be filed.

In addition to Col. Butler, members of the group making the convention study are Richard K. Wajda, Civil Aeronautics Administrator for the Department of Commerce; E. Bruce Miller, Civil Aeronautics Board; Robert Rosenbaum, CAA alternate for Department of Commerce; May R. J. Wall, USAF member; Robert S. Knecht, Navy Bureau of Aeronautics member; Norman F. Adler, Office of Naval Research, alternate Navy member; and Ronald C. Kerner, ACAA representative.

CAB Limits Airlines On Joint-Fare Action

Scheduled airlines may not get to either to discuss how to increase seat use, provided they limit the discussion to methods other than raising rates and fees, Civil Aeronautics Board rules.

Since the prohibition severely limits Air Transport Assn., it is reported that an association board meeting in New York will not be recommended.

• **Excludes CAB**—The airline group urged the Board last month for an authorization "broad enough to permit the industry to discuss and consider all possible methods of increasing revenues except competition for the transport

ation of road, which is being separately considered."

But the Board agrees that ATA failed to make a convincing showing that rate or fare changes are needed at this time. For the last several years, CAB says, the airline industry has enjoyed an extremely favorable level of earnings.

ATA told the Board the decline in earnings reported in the first quarter (Aeronautics Week May 17, p. 18) was likely to continue. CAB agrees that available evidence is not sufficient to warrant such a prediction.

• **Prohibits**—It is words of note, the Board says, "that while seat loads have remained stable or slightly declined and while traffic has increased to historic levels, and, in a small, enough have declined."

"In a situation where industry earnings appear to be declining severely because the growth of industry capacity has temporarily exceeded the growth in its traffic, it would appear to be premature to rush into a consideration of fare increases at this time."

CAB points out three factors in consideration of the airline industry.

- Profit or loss is sensitive to load factors.
- There is a substantial lag between placement of orders and delivery of new equipment.

• Under even the most favorable conditions, earnings fluctuate.

Stability on fare and seat levels is a major goal of any transportation industry and this makes it especially important in an industry as subject to short-term fluctuations as the airline industry that changes in fare and rate level should not be too closely tied to short-term fluctuations in earnings, the Board says.

• **Fare Controls**—It is our belief, says CAB, "that both the public and the industry should be better served by a level of fare which would reflect the actual cost rather than the needs of any particular year."

With this philosophy in mind, it is our intent to continue any future fare or rate rate proposal not only in the light of conditions prevailing at the time they are submitted but with full consideration of the historical earnings of prior years and the current earnings which may be expected in the future.

The Board notes that, should earnings fall markedly in the future, airlines will be expected to absorb losses with rate rates to fare or rate rate adjust events unless it can be demonstrated that such earnings are below the level necessary to provide a fair rate return over a reasonable extended period—which includes the good years as well as the bad.

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AERODYNAMIC FLUTTER which caused failure of angle steps resulted in this premature destruction of test flow components during NACA test. Stalled blades popping the flow instability around the wheel may be the contributing cause of this kind of flutter failure.

NACA Pushes Supersonic Thrust Hunt

By David A. Anderson

Cleveland—Advanced turbojet designs that point the way to technically effective supersonic aircraft are being tested in composite tests here at the NACA's Lewis Flight Propulsion Laboratory.

NACA's program is one part of an accelerated but extensive engine development effort shared by industry, the military service and government agencies. The final goal is the development of turbojets with the high thrust weight ratio demanded for supersonic aircraft capable of sustained speeds in the neighborhood of Mach 2 (Aviation Week June 14, p. 12).

Biggest differences so far indicated for these new engines will be in the rear portion, but every other component will undergo extensive development to keep up with the requirements of higher thrust. The new compressor will have about half the number of stages currently used today, and may in some instances have as few as three. Its rotational speed will be about 40% higher.

Compressor will look like today's, but the inner case will be thinner. The turbine may be a single-stage unit of improved design with hollow blades cooled by air bled from the compressor.

► **Basic Problem**—There is one fundamental problem underlying work on



CLEARANCES ARE CRITICAL between fast-rotating compressor rotor and stator blades. Here NACA technicians check dimensions of rotor blades with microscope. Compressor efficiency depends in part on extremely accurate control of blade clearances.



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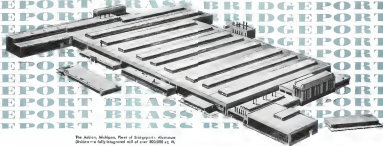
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AXIAL-FLOW COMPRESSOR of experimental jet engine is checked prior to test run at Lewis Flight Propulsion Lab, where NACA engineers are securing information to help designers construct improvement of helicopter propellers.

with engines they need to be able to produce huge quantities of thrust from a small and light package. But that is not enough. Component efficiency must be high enough or the fuel consumption would be too high to make the aircraft an effective combat airplane. In other words, the airplane has to have enough range to do the job, as well as enough power to fly at supersonic speeds.

NACA, like other agencies in engine development, is playing the field with studies on turbosets, wings and rotors. On the latter, perhaps the toughest problem of all, most designers are intent because of the mechanical ability of turbines designed for supersonic combat. There are a number of current engine designs with significant potential, but there are no current production engines available which can make these advances unless they fall potential.

What can be done short of that? Here are the details of NACA's approach to that important question.

► **Compressor Stages—Bypass, Inlet and Root Complex Check of the Turbojet in its compressor.** Its sole task is to pump air through the engine. Double the mass flow of air and you double the thrust.

So, one should try to improve a turbojet in its compressor by making it pump more air. If you can reduce the weight of the big rotating parts, while maintaining its air-handling capacity, there should be substantial savings. That's the general reasoning behind NACA's several proposals.

One of the first attacks centered in the inlet guide vanes. These are fixed radial sections just upstream of the first stage of the compressor, and their function is to direct the air so toward the first stage in the most efficient aerodynamic manner. But on our installation the NACA scientists removed the guide vanes, and the airflow through the engine increased considerably. There also was an increase in the pressure rise but not in proportion to the airflow increase.

► **Blade Length—Another approach** was to increase the radius of the gas by increasing blade lengths toward the hub of the engine. This keeps the mass outside diameter, but reduces the hub diameter.

NACA proposes for defining the amount of blade length is called the hub-tip ratio, and is the ratio of the hub diameter to that of the blade tip diameter, and, of course, always less than 1.0. Current turbine designs have typical values of 0.7 to 0.9, NACA has experimented with blade lengths down to a ratio of 0.5, which represents a potential maximum for hub diameter.

Overall pressure rise across the compressor depends on the number of stages and the pressure rise per stage. If the pressure rise per stage could be increased, then the number of stages and the weight of the compressor could be reduced.

The solution in this case is almost obvious, and consists of increasing the rotational speed of the compressor. By going from a current typical blade speed of 1,000 ft/sec to the higher



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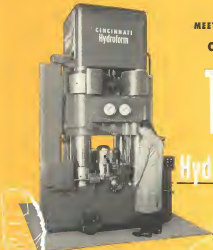
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value of 1,400 lbs. NACA scientists now able to show a pressure tube reduction about 1.5 to more than 1.7, about a 15% increase.

► **Profit and Loss**—These gains in performance bring problems with them. Boundary layer buildup and temperature spikes tend to drop the compression efficiency as the tip Mach number increases above Mach 0.7. This calls for aerodynamic redesign of the blades.

► **Larger Blades** which gain more air bring an increase in blade stress, they may also develop aerodynamic flutter at all design conditions.

In mitigating the flutter problem, NACA scientists have come up with what they believe is the right action in starting the destructive chain reaction of flutter. They have found that a shifted condition develops in a particular portion of the compressor wheel rim, and areas around the wheel in a direction opposite to the rotation. This she motion, dubbed "rotating stall," is apparently the cause of flutter.

Tests later show that as many as 12 separate stall patterns can be acting on the wheel at once. If the frequency of these aerodynamic loads equals the natural frequency of the wheel, resonance sets in and the trouble begins.

There are some solutions available to lack the problem. But NACA says that these are variations in the pattern of rotating stall lines, expert to engine is a production lot, and this is going to make the answer more difficult to pin down.

► **Do They Work?**—During the engine tests, a test case was a comparison of advanced design and of low design which had been adapted to a regular production redesign. Qualitative ratings of blade vibration were given by an oscilloscope, and the same level could be judged visually.

During the operation in the design point, the engine ran smooth and the blades were vibrating wildly. But at about 60% of the design rpm, the same level dropped sharply and blade vibration calmed down.

The engine was not run to full power during the demonstration, this was because it was a redesign, new experiments would wait. It had been taken to full power more times, but there was not yet proof in drawing it for the design output.

► **Lighting Firm—Combustion** is a subject is generally done with great efficiency, but even a trace of inlet conditions which sometimes leaves much to be desired. The flame now blow out at various air velocities, or may die out from low air pressure in the chamber.

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beston expert. Whatever solution he comes up with will have to be a non-potential.

Conest combustors are jet engines generally consist of a chamber with an internal liner which is punctured with a series of holes. The inner liner shields the wall of the combustion chamber and also serves as a flame holder. The liner diameters are critical, make them too small, and the flame will not stay held in the liner. Make them too big, and the pressure drop loss through the chamber is too much to tolerate.

NACA's combustor experts will not go into details, but they have taken the same basic pattern of liner holes and adjusted the area of the holes, they have come up with a liner which meets to various requirements.

It can handle considerably more than twice the current airflow, and burn at a higher efficiency. There is no increase in pressure drop but it is tolerable and under the figure that had been set as a target maximum of 10 in. Hg.

► Turbine Wheels—The burned fuel on contact blades out of the combustion chamber and while through the turbine wheel, supplying power to drive the compressor and thrust to drive the aircraft.

The turbine has to work under trying conditions, whether at high rpm, it must handle pressure and temperature which make many materials. Two Approaches—Much of the NACA's work on turbines has been kept under strict security. In general, it is "long two basic materials and cooling."

► Materials—Investigation of new materials, ceramic coatings and composites have been underway at Lewis and at other laboratories to NACA for several years. They are leading to a wider selection of turbine materials for future designs.

► Cooling—Turbine cooling offers real advantages, NACA and engineers believe. By bleeding air from the compressor and mixing it through the shaft and out through turbine turbine blades they can cool the blade at a much higher temperature because of the natural cooling.

The reason for these problems is very simple. It is that most of the heat is conducted at, during which time, the inlet temperature of the turbine. If you can move that temperature, you can move the thrust.

► Other Problems—There is more to a turbojet than combustor, turbine, and a turbine. There are bearings which are and are and are, there are lubrication problems which only synthetic oil can solve. NACA is talking those synthetic components with its own engine as it is working over the big issue.

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When the removable nut in the NIS-999 series is used, installation of anchor fast on sub assemblies can be made before chemical cleaning, painting or other surface finishing. Since the threaded locking element can be inserted later, it cannot be damaged or corroded by finishes. The removable nut design also permits easy replacement of the threaded locking element if it should be damaged in service, or if repeated removal and replacement desirable.

NIS-999 removable self-locking anchor nut. Meets all standard dimensions of NIS-999 Anchor Nut and NIS-999. NIS-999: complete set in AN-100 and AN-1000 series type nuts.

NIS-999, available in quantities of 100, AN-100 and AN-1000 quantities of 1000. Anchor nuts for use in steel and push-out. **REPLACE** approximately 100 for installation. **REPLACE** available in 100, 1000 and 10000 standard sizes.

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anchor nuts
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the same kind of leakage, but made of a different material, a new steel that will take the 300F to 500F temperatures at the rotating part.

In general, then, these advances are guidelines along one development road towards tomorrow's jet engines. Put together, the components tested here build an engine which is similar to today's, with one big difference in the compressor and a number of little differences down the rest of the line.

It looks like this. A compressor wheel is low leaf tip ratio, perhaps as low as three stages, but more probably five, rotating at about 40% higher rpm. There is a compressor, about the same size as the last you see today, the loss is no longer, but it is thinner, and the hole pattern and vanes are different. A single-stage turbine, with blades cooled externally, handles the increased flow with improved blade design.

The only remaining problem is how to put that package in an engine and not run it through oil with a poor combustion and high duct losses.

The installation of these advanced engines will be described in a separate article to follow.

PRODUCTION BRIEFING

►Douglas Aircraft Co. plans to put class land now accepted by Culver City Studios to meet an addition to its Santa Monica Division. The addition will include offices, machine shops and light manufacturing buildings.

►Boeing Aerospace Co., Renton, Wash., is using an automated SDR-140 and SDR-140 machine assembly using an air gun to install nut plates on KC-47 assemblies. Tools are a punch and compressor (not required). Punch is not controlled by a cone placed in the large nut plate hole. It locates and punches holes in metal up to 4-in. thick in one operation without need for auxiliary jig or positioning feature. A special fixture positions the nut plate and holds it in position. The compressor (not required), which fits over the fixture, elevates need for a vent block.

►Mechonics, Inc., Bridgeport, Conn., has completed 170 special tools to make Pylon Apache business plane engine mounts.

►Eckman Fuel Engineering Co., Rockford, Ill., is now producing a full line of DO (displacement) alcohol valves designed for aircraft control devices, laboratory instruments and other applications. Valves are for standard control of fluid flow and automatic cycling.

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The simplest Verson hand dies in the most intricate progressive die and punching combinations. Over 200 of the most common dies are illustrated in the Verson Die Manual which is available on request.

TECHNICAL AIDS—Verson technical aids include the 112 page Die Manual which is additional to illustrating typical dies, gives much advice and application data available elsewhere. A separate manual is a handy pocket size design checklist which quickly tells the manager required for making any hand. Copies of both of these aids can be had by request on your company letterhead.

Whether your equipment is press brake and press brake dies, it will pay you to have full selection. Use up Verson's complete service available at all times. Check this list and write for the data you need.

PRESS BRAKES—The Verson line includes both air and hydraulic models ranging from the 16-in. which will bend 48" of 16-g. mild steel up to the largest ever built. Included in the line are two standard models available from stock. Catalog 10-51 which gives full specifications is available on request.

PRESS BRAKE DIES—The Verson line ranges from

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✈ **Warner Airbase Chief Pilot**—Captain George B. Brady, says, "The team is on only a few of the major test hours from system SPAR, but the test proved performance out of 3 every time. With its superior accuracy, SPAR has out-dipped all other GCA in the competition."

NOW every airport can afford to lick the weather

Laboratory for Electronics Announces: — Seasonal low-cost, portable SPAR (the Super-Precision Approach Radar) . . . enables every airport to afford a Ground Control Approach system. Already tested and proven, SPAR is now in quantity production, ready for definite delivery.

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This new precision approach radar . . . is light and portable that it can be shifted by helicopter . . . so simple it can be set up in less than two hours and operated by one man . . . is the answer for any size airport or airway. New airport income and business lost to your town because of cancelled flights need no longer be a major concern.

SPAR's ease of operation and simple maintenance requirements, established in field demonstrations during the past year, have caused civil and military aircrews. Time after time in test per-

formance, SPAR has brought in all types of aircraft from jet fighters to Convair-Lincolns in within inches of the runway centerline. Yet SPAR sells for 1/3 the price of other available instrument landing aids, saves money on operating expense and maintenance.

Write for Performance Specifications on SPAR and delivery dates. Also, special information for municipal airport managers on how SPAR will pay for itself at your airport. All inquiries from foreign countries should be addressed to Bendix International Division, Bendix Aviation Corp., 215 East 52nd Street, New York 17, N. Y.

✈ **On Schedule:** SPAR, laboratory for Electronics' latest electronic development for American airports, shows similar controlled approach from the benefits of "hot standby" due to lack of a Ground Control Approach system. SPAR is high precision instrument radar, 20 ft. from point of touchdown and in and out the rest of way, other conditions, instrument landing aid. SPAR also can be operated, less to install.

This is the equipment which has demonstrated and proved by performance the probability of replacing light weight, portability, and low cost to a GCA system. Today SPAR is the only such system with a record of actual performance on the field. SPAR is ready for your operation. You can watch it in action, test its performance, and let it run day. SPAR to meet your delivery dates because it was in quantity production.



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SPAR's greatly simplified design keeps price within range of all airports, gives both strength and accuracy precision "hot-standby" operation through shock-resistant compact flight parts designed on high precision 1/2 inch diameter on ball or by remote control to give airport towers long-range view of modern developments in parcel operation under most possible weather conditions.



World's first radio system to successfully combine ruggedness and reliability of all-weather equipment with economy of industrial quantity production. SPAR's light weight and easy portability fit all weather conditions. SPAR can be completely operated in 8 inch hours and can be converted at any time to different airports in less than 10 minutes. The instrument control unit can be operated from a helicopter or a control tower. In April 1954, during Operation Bluebird at North Air Force Base, North Carolina, jet fighters made over 200 landings against SPAR.



SUPER SABRE tail design is unusual. Low drag, nose-fin horizontal surface is all-weather, short vertical tail has small rudder.

NAA Refines Super Sabre for Supersonic



VERTICAL TAIL is very thin, has been redesigned and lowered in production craft.



SINGLE RUDER is single cast on Super Sabre in contrast to paired leaders on earlier F-105 units. Rugged, easily fit structure is operated hydraulically.



HORIZONTAL TAIL is all-weather "side" type, low position on fuselage gives stability advantage at high speed.



NOSE INLET of F-105 is pivot type for high efficiency over entire speed range. Airframe is lowered in open up.



CONTROL SYSTEM is mounted on the mechanical hydraulic test apparatus in laboratory system of full-scale performance.

Performance

First detailed picture of North America's F-105A Super Sabre shows some of its unusual design aspects required by the demands of supersonic flight.

Most noteworthy is the control system. Horizontal tail is an all-weather surface referred to as the "side" type, located by aerodynamicists for speeds above the transonic. It is mounted low on the fuselage, almost in a direct line with the wing, instead of as the high inboard (typical) scheme. Large deflection range of the surface is clearly shown.

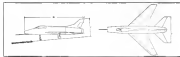
Vertical tail has been redesigned from the high aspect ratio layout of the prototype to a considerably shortened structure, the rudder is much smaller in area than originally.

Lateral control surfaces are located at midspan, and are split spanwise. This may be so that all of the area can be used during long-range flight, and only part of it during supersonic flight of the Super Sabre.

F-105A is a day fighter; further developments will be the F-105B all-



THIN WING requires thick skin with structural members welded into the heavy stock. Number of individual sections needed is greatly reduced in this structure type.



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VARD BALL SCREWS—the most efficient means known for transmitting rotary to linear motion—are utilized to actuate the flaps of the new Boeing 707. Vard is proud to have participated in the design and production of important components in this forefront of American jet transports.



a production model of the Boeing 707 Stratotanker-Stratoliner would be capable of high-speed, high-altitude refueling of existing and future jet fighters, bombers and other combat aircraft.

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PRODUCTION



SEVEN CRATES carry Matador's basic components. Based on the builder's nose, center and aft sections, the wing, fin, stabilizer and instrumentation.



SEVEN CRATES components are laid out in just 10 minutes. Wing panels fit into center section after 10 minutes opening. Stabilizer is an integral part, too.



POSITIONED for assembly, parts are laid up opposite their respective stations.



MATADOR IS FIRED from its mobile launcher. Bombs drop off when exploded.

Matador Packaged for Fast Field Assembly

Study of the Matador Matador points up the refinement of the design team. Following is a summary of the program.

The B-51, in effect a large ground-to-air missile, incorporates a break-down scheme. Stabilizer, nose, wing, center and aft sections, the wing, fin, stabilizer and instrumentation. The B-51, in effect a large ground-to-air missile, incorporates a break-down scheme. Stabilizer, nose, wing, center and aft sections, the wing, fin, stabilizer and instrumentation.

Costing Scheme—There is no dual as stable, low operation as the Matador wing program. Instead the configuration is left broken down into seven major parts—the nose, center section, aft section, wing, fin, stabilizer, and instrumentation.

These components are weather-proofed and packed in transport crates for easy and fast shipment to forward positions or training grounds. The components are not assembled until just before it is desired to launch the missile. The major components are interchangeable, which means that a specific set of assemblies need not comprise any particular complete weapon.

Firing, Disassembly—Matador is easily fired from a mobile launcher just about as long as the missile shell and warhead (with the wing spread). Elevated to the launching angle, the missile takes off, as shown in the photograph. The Matador is a rocket-powered missile. The Matador is a rocket-powered missile. The Matador is a rocket-powered missile.

The missile is reported to be 33 ft. long, 45 ft. in diameter. Tailfin height

is topped at 12,000 ft., range 200 mi. (American White Mail 15, p. 80). During its test flight, the missile carried a nose-mounted camera.

Feasibility Factors—In the test as shown in the photograph, the Matador is shown in mid-air, with a large plume of smoke and fire trailing behind it. The Matador is a rocket-powered missile. The Matador is a rocket-powered missile. The Matador is a rocket-powered missile.

The stabilizer incorporates a single

USS Carilloy steel passes rigid tests for propeller blades



1948 USS CARILLOY aircraft propeller hubs are forged and machined from semi-killed Carilloy 4240. They meet extremely tough magnetic requirements.

FOR HIGH PERFORMANCE: 3 forged sections (a) are rolled together to form one. Hubs (b) are then ground and semi-killed. Killed ground, and semi-killed again (c). Mill center electric (d) then are copper treated to the thrust members. Hubs are in level (bored and polished) before final magnetic test and radiographic plating. Extensive inspection testing assures that every finished blade (a) can withstand the tremendous stresses encountered on the latest high speed planes.

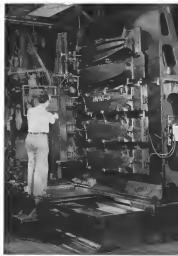
An important manufacturer of propellers for military aircraft has found that in stringent magnetic tests, USS Carilloy steel performs completely satisfactorily.

The high stresses in propeller blades and hubs naturally require extremely high quality steel. Accordingly, the U.S. Army and U.S. Navy have set up rigid quality specifications requiring that every heavily stressed part must be magnetized several times during its production.

With USS Carilloy 4240 electric furnace aircraft quality steel, this important manufacturer is able to count on the performance required for this severe application. The consistent high quality of USS Carilloy aircraft steel has meant greater savings to this customer through numerous magnetic rejections of costly fabricated parts.

USS Carilloy steels have established an enviable record for meeting the highest quality requirements. Therefore, when you need a standard AISI number or a special steel for an unusual application, it pays to call in a USS Service Metallurgist. He can help you solve any steel problem.

AFTER FORGING AND MILLING 100% dead magnetic are tested on the Magnetic Shear. Finished sections weigh about 350 lbs. USS Carilloy steel maintains a No. 1 quality position on these heavy-duty parts.



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UNITED STATES STEEL



FLYING BARRACK—This igloo-like shelter, designed for Marine Corps use in the field, can be transported by air. The dome is 15 feet high, 34 feet in diameter, and can

shelter up to 40 men. Even in a stiff wind, the 1000-pound plastic-covered hut can be moved easily from place to place by a Marine Corps HO4S Sikorsky helicopter.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS



WINDY WINGS—A damaged light airplane was "rescued" from the frozen surface of Thunder Bay on Lake Superior by a charmed Sikorsky HO4S helicopter, and flown 35 miles to a repair base—Amdank Airfield, Limited, of Ft. William, Ontario, operates the new Canadian charter service, with S-55 equipment exclusively.



PRACTICE MAKES PERFECT—This unusual photo shows a Sikorsky HO4S helicopter over the Hoo River near Seoul in a simulated rescue of a downed pilot. The practice mission by a U.S.A.F. Air Rescue crew was similar to nearly one thousand actual rescues during the Korean war, made on land and at sea behind enemy lines.



HELICOPTER EXPRESS—Regularly scheduled Air Express flights in Southern California have a new service started last December by Los Angeles Airways, Inc., and the Air Express Division of Redwine Express Agency, Inc. The Sikorsky HO4S, like that above, and S-55s, are used for the speedy shuttle to planes on the island in San Bernardino.



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glass which cut tube life. The new tubes can be operated at 300-400C without danger of wear-related outages at leaving the cathode and reducing tube life.

After operation used in conventional tubes was easily deformed and before was reduced by the hole, pinching operation. Current system also takes input and will respond to pinching operation.

After insertion of 64 between electrode supports and into holes in case contained tubes, required under conditions of 10 to 100 or shock loads to enlarge the cathodes, produce tube replacement. In the sealed tube, extreme space not required in discharging heater tube's electron.

Other Advantages-Sylvania requires no extra mechanical adjustments for the new stacked construction.

After sagging, the new technique produces a rigid assembly with a low cost of parts, making tube less affected in vibration and shock. From reported that atmospheric some of a sealed tube under vacuum is much lower than in conventional tube types. If the stacked tube is mounted in a sealed vacuum housing instead of a glass bulb, it can be dropped and then used a second time. Before reported.

Results thermal shock. The conventional stacked tube has been removed from liquid nitrogen at a temperature of -190C and plunged into boiling water (100C) without fracture. It has also been heated more than 100 times from room temperature to 450C without damage. Before reported.

Longer life. Current stacked tubes have been operated at 1000C for 1000 hours with less than a 15% drop-off in life to inoperability. Tubes now are at 400C have been operated for 1,000 hours with no life reduction. Tubes required. Even for conventional tubes, such as high-gas cathodes, such conventional tubes are limited to 175C.

Manufacturing Advantages—The conventional of a tube manufacturer, the new technique has several attractive advantages.

Power critical dimensions. The thickness of the ceramic spacers, which form the interelectrode space, is the only critical dimension. This can be held to 0.0005 inch. From now, in conventional tube construction, there are a variety of critical dimensions including location and diameter of ceramic spacers. These cannot be held closer than 0.001 inch. Before reported.

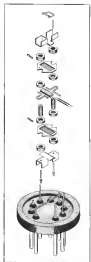
More rugged elements. Individual elements of the tube are more rugged, less likely damaged in manufacture and in use. Sylvania engineers say.

Greater reliability. An example of the ruggedness of tube materials, resulting from the Sylvania technique is a com-

parison of the quad of metal can diameter (Q₁) for a group of stacked and conventional tubes. Measurements were made before testing and milling which normally waste out tubes outside tolerances. Manual construction of non-conventional tubes varied between 960 and 2,000 microns. Q₁ spread for 64 stacked tube was only 1,500 to 1,700 microns.

Life Test Comparison—Sylvania can show 64 tube in a sealed tank, type 8N 17340, in a glass envelope and on a conventional 6-pin glass tube type 5718 at same temperature. After 2,000 hours, the stacked tube G₁ had dropped only 5% compared to a 13% drop for the conventional tube.

When both were life tested at a 175C



SYLVANIA tube, as depicted here, shows unusual ruggedness of elements and illustrates how tube can be machine assembled.



Sylvania represented new tube stacked-tube tube has some advantages, more efficiency, compact with Sylvania stacked tubes. WACQ sponsored Sylvania's work.

temperature, the stacked tube's G₁ dropped less than 15% during the first 1,200 hours, compared to 31% for the type 5718. Then the stacked tube's G₁ fell off sharply to reach a value comparable to the 5718 at the end of 2,000 hours. Sylvania attributes the sharp fall-off to electrolysis of the glass envelope, not to external tube shrinkage.

Life tests of a ceramic envelope stacked tube (8N 17340) show a G₁ drop-off of about 10% after 2,000 hours of room temperature, slightly higher than the tube in a glass envelope. Sylvania attributes this to difficulties in processing ceramic envelopes, adds which, rather, has little experience. The same tube expected at 300C ended up with a G₁ drop-off of about 10% at the end of 2,000 hours, although it fell to 17% midway in the tests.

Disadvantages—Indirectly, the appearance of the new stacked design is slightly higher than for conventional construction, Evans admitted but more reduction has been achieved and more is expected.

Sylvania's work in this has not included as common such as the cost of manufacturing the new tubes. Evans believes that tube savings may offset the slightly higher material costs of the new type of construction.

Weight Comparison—In a glass envelope, the new Sylvania 8N 1734 weighs 55 grams, lighter than its conventional 64 counterpart at 73 grams. In a ceramic envelope the new tube weighs 116 g, about twice as much as a 64. However, if Sylvania ceramic tubes were substituted for conventional ones as an interstage weight, 60 tubes would equal 64 tubes. This is a small gain for gain for improved reliability and long life.

If external miniaturization can develop stronger materials, such Evans thinks they will, the thickness of the ceramic

envelopes will and its weight can be reduced.

Sylvania has proposed to Navy's Be Ship the further development of its stacked tubes to achieve smaller and lighter. The next step would be for design of modules to assemble the stacked tubes automatically.

Evans's Approach—Earl McCullough, who has been looking around for a replacement, is exploring ceramic construction of vacuum tubes under USAF sponsorship. Evans's Herald Ring is partial. Objective is a miniaturized, high-temperature operation.

Evans has designed an all-ceramic monolithic whole performance is as close as possible to a conventional (8N) in mounting external features of this tube (64), made from its ceramic will be made possible in the use of flexible leads instead of the insulator plugs. Evans expects the tube to be so reliable that it can be soldered into a circuit like a resistor or capacitor.

Stacked Construction—The Evans tube also uses a stacked construction for ease of mechanical assembly. In the experimental tube, inside the two spacers are contained at the corner and side (one exploded view, shown). Grids are formed on a ceramic base in a photomask electroforming process. The cathode helix and heater element are overlaid on a single grid for structural rigidity. Ceramic spacer support and separate the tube elements which are heated solely in position.

The stacked construction of Evans tube that of Sylvania is adaptable to a variety of tube types. By mounting the grids one has a two-diode. By inserting more grids the tube can be made into a twin diode. Similar built-in wire connections is possible for other single grid function tubes.

Better Construction—Elimination of metal and glass permits the new tube to be baked and extracted at high tem-

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1938	8"	10 lbs.	\$18.00
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1944	9"	10 lbs.	\$24.00
1946	9"	10 lbs.	\$25.00
1948	9"	10 lbs.	\$26.00
1950	9"	10 lbs.	\$27.00

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putance (150C or higher) to get rid of contaminating gas. This character the need for bush type getters used in conventional tubes to remove residual outgassing gas but which themselves may introduce impurities into the tube envelope atmosphere.

Various plans to produce the new type tube, in a pilot lot, have to evaluate the design, but Seg expressed that the design is an adaptation, one not subject to change. Although such a measure is to be done in our work and no quick results can be expected in a long-range program of the kind, satisfaction is felt that we are making headway toward the production of more reliable tubes," Seg said.

"With the improved electron tubes, there certainly will be fewer failures of the cathodeless kind in the mechanical circuitry. There is also good reason to believe that failures in the electrical circuitry will be alleviated," Seg concluded.

Frequency Can High-Inductance vacuum tubes are being to make "old-fashioned" tubes perform reliably in the high-frequency applications, high shock environment found in guided missiles have captured the hope that Navy and USAF will put all possible action behind the Solvex and Eusex programs to bring them out of the laboratory and into production.

New Avionic Products

A new line of sub-miniature non-linear ceramic capacitors whose capacitance can be varied as much as 50% by a change in the applied d.c. potential is one of several recently announced components suitable for aerospace application.

The new non-linear capacitors, which are also temperature sensitive, come in two types: VSR, whose voltage limits range in a maximum of room temperature, VSR whose sensitivity is maximum at 75°C. Capacitance values of 100 pF and larger are available. Motorola Corp., 951 Francis St., Newark 3, N.J.

Other new components include:

- Subminiature switches, Type USM, (Therco) in ceramic or plastic or



leaf selector styles, SPDT, rated at 5 amp, 125/250 v.a.c., or 2 amp, at 30 v. d.c. (Aviation Switch Div., W. L. Mueser Corp., 460 W. 34th St., New York 1, N.Y.)

• Miniature photo-transistor, p-n-p power Type 83M6, is hermetically sealed in glass bulb only 1/8 in. dia., 1/4 in. high. A sub-miniature version, only 1/8 in. dia. x 1/4 in. will soon be announced. Technical details and recommendations on tests can be obtained from Radio Receiver Co., Solvex & Eusex Division, 251 W. 19th St., New York 11.

• Microwave diodes, reportedly able to supply 14 cubic feet per minute under continuous duty, as powered by 1 per centum magnetron d.c. source rated at 6 to 315 v., 1 amp. (Idea Precision Equipment Co., Pioneer Electric & Research Corp., 741 Circle Ave., Farmington, Ct.)

• Tube socket for printed circuit boards, made of Mycelar 450 glass-headed metal, has loss factor of 0.014 at 1 mc., power factor of 0.0015 at same frequency, according to manufacturer, Mycelar Tube Socket Corp., Clifton 184, Clifton, N.J.

• Low-loss contact rods of the thermosetting type, has a dielectric constant of 2.16 to 2.34 over frequency range of 60 cycles to 10 kHz, dielectric strength under 0.0049, dielectric strength of 450 v./mil, and volume resistivity above 10¹⁰ ohm-cm. according to manufacturer.

• D.C. motor, Type 88, containing 1 in. dia., 1 1/2 in. long, is permanent magnet motor, operating from 27 x 55 v., with stall torque of 1 in. oz. and no-load speed of 14,000 rpm. Derrin has double-shielded life-lubricated bearings, weighs 2 oz. (Manufacturers of Globe Industries, Inc., P.O. Box 101, North Dayton Station, Dayton, Ohio)



ILS-VOR Indicators

New ILS and VOR indicators, model ABC 16796 combine two-power meter and outboard remote selection in a single 5 1/2 in. instrument weighing 3 1/2 lbs. (Continental Motors Corp., 2001 W. 34th St., New York 1, N.Y.)

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Cessna's new Model 310 is truly a star performer, and Continental 0470's are two big reasons why. These modern, air-cooled, aluminum engines develop 340 h.p., mesh, but require minimum space, hence lend themselves ideally to modern plane design. Like the other models in this pioneer power plant line, they embody the results of specialized experience dating from 1902. Moreover, they're backed by service and parts wherever people fly.

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1. *Exposure and handling of animals*. New grade 11th and 12th students at the school were given a written description in basic information before the procedure of the first Spinal Cord Injury. (Appendix 1: 10th)



Light Gyro Compass System Has Low Drift

Bulletin GEA-9995, describing the new MA 1, may be obtained from the manufacturer, General Electric, Schenectady, N. Y.

Planetary drive for interplanetary travel?

Contact Executive Office, Western Gear Works
PO Box 102, Leonard, California

necessary drives than any smaller company, for this is scarcely an understatement today that does not have one or more Western Gear products aboard.

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FAST STAND used by Bendix to check operation of jet engine fuel control.

Stand Gives Fast, Accurate Checks

Equipment for testing Bendix jet fuel control units is correct to .5% at flows of 85-30,000 lb./hr.

A new test stand, with highly accurate measurements, gas laboratory precision and production-line speeds on jet engine fuel control units built by Bendix Products, according to Bendix's division, Bendix Instruments, Inc., under of use of the stand's components.

Examples of the accuracy required of the stand are:

- Rate of fuel flow: 0.5% through a flow range of 85 to 30,000 lb. per hr.
- Revolutions per minute—output speed must be determined to an accuracy of ± 1 rpm over a 27 1/2 range.

A Bendix effort says "high accuracy demands were otherwise met only through elaborate laboratory-type instruments, requiring skilled technicians and slow, costly laboratory techniques."

These obviously were inserted to the production conditions found at Bendix. As a result, the speed instrumentation and test stand was developed. A large number of stands are now in use.

• **Fast Stand-General**—The test stand is conventional in appearance—it can burn fuel meters, atmosphere and fuel pressure gauges, etc., associated controls and a digital output under the test to be tested.

Among the components under test making up the stand are fuel tank, heat and pressure pumps, bank coil—high-pressure 5000 lb. 5 second, input and output fuel rate meters, electronic tachometer, attitude indicator, meter tubes, pressure, thrust, and so on.

collisions prevent measuring meters. Electronic measurements have been taken to reveal the possibility of development due to the explosive characteristics of the fuel being handled.

Precautions have been taken to prevent sparks or flames in the fuel area. All electrical equipment is designed to meet Class I, Group D specifications. Blow-out ducts and heavy safety glass enclose the flowmeter tubes. Instruments are mounted on a thick aluminum panel with connections at the back of the panel whenever possible. And facilities are provided for draining any fuel spilled when changing components and entering the fuel to the supply tank.

• **Flowmeter**—The flowmeter, manufactured by Commercial Research Laboratories, Inc., has a maximum and minimum outputs of 15 to 30,000 lb./hr. with an accuracy exceeding $\pm 1\%$.

The flowmeter, Type 12, and is made up of six Pyrex glass centering tubes with integral flow guides. A moving float in each glass section, in its position in the glass, the rate of flow. If flow rate exceeds the full range of a given tube, float goes to the top of the tube and is read on the adjacent tube. Readings are taken from a logarithmic scale.

A rigid calibration check schedule is incorporated on the flowmeter, with a complete modification being made every six months weighing equipment.

In case of calibration shift, new scales are engraved on the flowmeter.

• **Tachometer**—Bendix did a lot of original research to develop a tachometer accurate enough for the test stand.

On the electronic digital tachometer, Bendix is capable of giving the accuracy required of ± 1 rpm, plus quick, zero reading of the tachometer. The tachometer has the reading complexity of the electronic high-speed tachometer, complete tachometer, the positive reading error, accuracy, associated with water tachometer measurements. And the electronic tachometer can be calibrated quickly and repeatedly, re-setting is a matter of "zero time."

The electronic tachometer is made up of three units: the variable reluctance pickup, the sense line and output unit and the electronic pickup, which is a variable reluctance element, a 120-tooth gear and a shaft on which the gear is mounted. The sense element is a permanent magnet surrounded by a coil. Each time one of the teeth of the gear passes under the head of the permanent magnet, the reluctance varies.



ELECTRONIC TACHOMETER yet-17 is a variable reluctance pickup unit.



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and a voltage is induced in the coil. Since the moving element is a low resistance device, it is possible to cable this output over a considerable distance to the remote EPUT (Elements per Unit Load) meter.

The EPUT meter consists of a two cycle-per-second, crystal-controlled time base, an input amplifier driving an electronic gate, and the gating section. The time base activates the gating circuit which in turn opens the electronic gate for a 0.5 second. The inductive pulses received during this precise 0.5 second period are passed to attenuated form to the cascaded digital counting unit in the digital indicator. At the end of the counting period, the gating section begins timing the length of the display of the digital reading on the digital counting unit. This display can be adjusted from 0.5 seconds to infinity. At the end of the display time the reading is erased and the system is ready to make a new reading.

The first digit indicator is composed of four cascaded counting units and an input amplifier circuit. Power for the unit is obtained from the basic EPUT meter. The input circuit is used to bring the attenuated signal from the EPUT meter up to a level suitable for driving the first of the cascaded decade units. The number of pulses passed by the electronic gate are then indicated on the decimal counting units. The result is indicated in decimal form on the numbered logic panels of each decade. Since 100 teeth are used on the gear and the counting interval is 0.5 seconds, or 1/200th of a minute, the digital indication is directly in rpm. The scales can be set so that a reading is made once every second.

Other—This stand is also equipped with a warning pump for vibration and various pressure switches which give the operator a clear picture.



Ten-in-One Vibrator

Anomaly Corp. uses this synthetic test set combination test stand to vibrate aircraft seats at 10 times of engine and aircraft base made in the company. The stand, as called at the first Jackson, Mich., plant, vibrates from 1 to 1000 cycles per second at 1 to 1000 rpm frequency.

AVIATION WEEK, June 28, 1954

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tion of the functioning of the fuel control system.

The stand gives results in the form of a curve showing rpm versus rate of fuel flow from idle to full throttle. These data are compared with a given standard and adjustment made if required.

The fuel control unit is designed to hold the greatest speed with a high degree of accuracy.

Test Stand Checks J73 Fuel Regulator

A new Goss Industries test stand checks the performance of J73 fuel regulators for General Electric J73 turbojet engines.

The stand simulates all operating conditions of the fuel regulator, including mechanical, hydraulic, pneumatic, thermal and electrical, and checks the engine's response, allowing comparison with specifications, says the Brooklyn, N. Y., manufacturer. Basic speed for the stand was set up by GE.

The test equipment is made up of an electric compressor main circuit, which houses the main valve of the stand's main control, forward panel measuring three fuel flow diameters with ranges from 120 to 15,000 gph, three discharge flow branches in the same range, including low flow to one valve; electrical control circuit; GE Thermo-tolerance and control cabinet; and an electronic main control unit.



TEST STAND built by Goss for GE

with an accuracy of ± 1 rpm.

The stand is powered by a 74 hp drive with a speed range of 75 to 4,000 rpm and with acceleration from 0 to 1,000 rpm in five seconds (based on inertia of 0.15 in./lb.-sec.).

Vickers Streamlines Supercarrier Motor

Radiators of Vickers, Inc.'s aerodynamic hydraulic motor has eliminated eight connections and two lengths of hose in the Douglas DC-7 supercarrier hydraulic circuit where the motor is used.

Known as Model V570-915, the unit features a special head, or valve plate, with integral relief valve, a temperature built-in test special ports for current applications, and the standard inlet and outlet ports.

The new design gives a weight/pressure ratio and saves weight, Vickers says.



British Beverley Opens Cargo Doors

The large aircraft door steps of the last engine, Blackburn & General Beverley design men, press a close view of the plane's loading unit, inside the freight

it stepped a large water-filled tank. The Beverley 20 of which have been ordered by the RAF, one take off from 1,000 ft run way and carry 25 tons of cargo.

NEW AVIATION PRODUCTS



Verithem control unit portable unit

Device Tests Tailpipe Temperature Systems

A new portable test unit checks duct and cylinder tailpipe exhaust temperatures, without engine crank, according to its manufacturer, C. I. Kell & Co.

The Verithem unit is designed for checking engine exhaust Kell says, but also may be used to test tailpipe temperature system in commercial aircraft.

Here are the steps used in the Verithem test:

- Electric heater coils, containing low pressure sensitive elements, are slipped over the exhaust temperature probes.
- Hot air applied to the thermocouples by means of the control unit, and the resulting temperature is read.
- Complete adjustment or exhaust temperature control is checked.
- Ground leakage test is made while the thermocouples still are hot by passing a current in the control unit.

Kell says the 25 lb. test unit has a range of use to 100°C or 450/1,000 and has an accuracy of within 10°C. C. I. Kell & Co., Toronto, Canada.

New System De-Jets Jet Engines, Planes

Cook Electric Co. has developed a new device that automatically detects aircraft fueljet engines and also can



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The Warner Division of Detroit Harvester Company has moved into a new and larger manufacturing plant.

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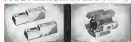
Compact Four Bolt Telemetering System Model T-10-1

This package with its ruggedized high speed motor and 1000 cps output, will transmit a maximum of 10 channels of data. It is a complete telemetering system for telemetry applications. The package is available in a variety of configurations. The package is available in a variety of configurations. The package is available in a variety of configurations.



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Optimum Telemeter Configuration Model T-10-3

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serve as a control control for external devices as required.

The new system has met all Air Force qualification test requirements for jet engine and thrust air detection, the manufacturer reports.

Cook says the device consists of an air detector assembly and an indicator assembly, requires only a source of electrical power for automatic air detection and control.

In addition to aircraft driving, the indicator assembly can be used for industrial and other applications.

Cook, Electric Co., 7700 Southport Ave., Chicago



WASHER is made up of steel rings.

Washer Assures Accurate Airframe Bolt Preloading

Douglas Aircraft Co. has developed a new washer to give accurate preloading of bolts during assembly of airframes, eliminating the need for torque wrenches.

The preloaded washer, a PLI washer, now being used on DC-6 and DC-7 assembly lines, has proved it can be designed to assure an average tension of approximately 80% of the desired bolt preload. The aircraft manufacturer reports.

The company claims this will increase the fatigue life of bolts and give tighter assemblies.

Douglas says the torque wrench technique produces inconsistent preloads, varying from 10 to 80% of the bolt yield strength.

The new device consists of two concentric steel rings. The thick inner ring, which the bolt passes through, is notched, allowing the outer ring to move back until the desired preload has been reached. Change of washer dimensions and material determines the load.

Working on Douglas production lines use a disposable handle to "wiggle" the washer's outer ring during tightening operations. The handle can be shaped for easy access.

The company says its washers will be marketed as soon as licensing arrangements are completed.

Douglas Aircraft Co., Santa Monica, Calif.

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SPECIAL TOOL developed by Convar as gears for wing bolt pulling.

Bolt Puller Speeds F-102 Assembly

Wing bolts are pulled into place with relative ease on Convar Division's high-speed F-102 delta interceptor. A special bolt puller developed by Convar's New Diego tool project section does the job efficiently, eliminating the need for hammering.

An extension of slightly lesser diameter than the wing bolt is inserted at the wing root fitting to the point where the wing bolt enters the root hole. A double-blind washer and nut are fitted to the protruding end of the extension, which is threaded over the wing bolt end.

By merely tightening the nut, the wing bolt is driven smoothly into place. Only change on the wing bolt is its thread diameter, to allow the extension to be fitted.



Light Heat Exchanger

This all-aluminum end-to-end heat exchanger announced by United Aircraft Products, Dayton, features simplicity of design and high-efficiency heat exchange. The unit, model U-519135, weighs 21 lb., and has an performance heat capacity—560 Btu per sq. ft. flow—1,800 Btu/hr., oil flow—30 lb./min., maximum fuel pressure drop—25 psi at 10,000 lb./sq. in., maximum oil pressure drop—15 psi at 10 lb./min. Address: United Aircraft Products Inc., Box 1055, Dayton 2.



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Rohr builds more power packages for airplanes than any other company in the world — and this picture shows the Rohr power packages on the wing of the big, beautiful Lockheed Super Constellation. In addition to producing power packages for the world's leading commercial and military planes, Rohr Assemblies are currently making more than 25,000 different parts for all types of aircraft.

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PICTURE FILM: New Aero Tech school under after accident. "That flight" in last focus, they go on to see as the experts and students experience.

If it involves an airplane, East Coast Aviation has probably done it. Located at Bedford (Boston) Airport in Massachusetts, this unusual firm services resident and transient aircraft, operates the famous East Coast Aero Tech training school for pilots and mechanics, and participates in seminars ranging from post-crash to on-air rescue. No doubt about it—East Coast plans for a work-a-day.

That's one reason why, for the past eight years, East Coast Aviation has used Cities Service products exclusively. Says president John T. Griffin: "We have found Cities Service American Gasolines and Kwikolene Aero Oils capable of meeting the existing requirements of our customers and our varied operations."

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AIR TRANSPORT

Civil Aviation Law Outlook:

CAA Act to Be Amended, Not Rewritten

- McCarran hearings enter final phase, with agreement on need for new and contract airline certification.
- But CAB opposes granting of permanent certificates to segments of industry still in developmental stage.

Main accomplishment of two months' hearings on the 170-page McCarran Bill is that four aviation bills have been passed by all sides on the nondevelopmental airline side and will reach closely developments of Civil Aeronautics Board.

CAB action on this area, whatever it may be, is yet to have representation on Capitol Hill next year. The same question and the future role of North American Airlines, in particular, dominated sessions of Senate Interstate and Foreign Commerce Committee on the McCarran measure.

• **Committee Ruled—Mandate** at the committee who regularly attended sessions and showed a substantial interest in the future of contract and single carriers. Sen. John F. Kennedy, chairman, Andrew Schoenberg, Mike Mansfield, and George Stagg.

The two Democrats, Mansfield and Stagg, indicate they look with favor on the standard position. Schoenberg appears to have leaned toward the scheduled airline position.

Committee chairman Stagg's questions were more important. "The hearings will result in this work is a final session with CAB Chairman, Chas. Goetz and CAB member Joseph Adams."

The committee has accomplished what it set out to do, despite a second session concerning the need for changes in updating of civil aviation law.

• **No New Law?** The hearings developed these two areas of general agreement.

• **There is no need for a wholesale rewrite of aviation law, as contemplated in the McCarran Bill.** Whatever legislation is considered desirable should rely on the terms of amendments to the 1938 Civil Aeronautics Act. A new law would mean starting from scratch to build a body of legal and judicial opinions interpreting it.

• **Nondevelopmental airlines** should operate under CAB certificates. Differ from between scheduled and nondevelopmental is over the type of proceeding and criteria for obtaining certificates.

and the limitations to be laid down for operating authority.

The question of "quadrilateral rights" appears to be entirely a matter of governing the segments of the industry still in developmental stage.

Highlights of testimony by closing witnesses:

• **Former Sen. Joseph O'Mahoney,** representing New Hampshire, proposed a joint congressional "watchdog" committee "to check future actions by the CAB of the 1935 CAA Act."

He suggested the term "squirrel car" was developed by the Board, possibly because of the belief that the word "squirrel" was widely calculated to spread abroad the reputation of cautiousness, and a deliberate attempt to mislead the law.

"Give a dog a bad name is the theory under which they have been kicking us around," he said.

O'Mahoney argued that Congress never intended a classification of airlines as "squirrel."

"There is clearly no right in the Board to deny a certificate to any carrier engaged in air transportation if it is fit, willing and able and a public convenience and necessity exist," he testified. "It may power is to determine what the true and conditions of a certificate should be."

Declaring that the recommendations of Air Coordinating Committee's recent report "have not yet attained the dignity of presidential authority by the President," O'Mahoney criticized Chairman Undersecretary for Transportation, Robert M. Weaver's "advisory of a policy of merger and consolidation by which a new or map of the U.S. is to be drawn and the industry is consolidated and controlled that the days would be permanently that to all interest who might desire to enter."

• **Alexander Hardy,** assistant vice president of National Airlines, sharply criticized O'Mahoney.

"It is dangerous," he told senators, "when I consider . . . a former champion of the law controlling that the North American airlines should be considered for its wholesale violation of the law by being singled out as the only carrier in the U.S. to receive the authority to operate all of the major routes on the nation without showing a need for such power in a CAB proceeding."

He observed that this "violation of the law should be remedied by Congress."

"North American openly admits and says that they are violating the law," Hardy said.

• **Elmer E. Johnston,** president of Air South Transport, Inc., argued that "the independent lines be put on a permanent footing under some type of air carrier certificate, rather than emergency route." This has long been needed so these lines can protect their plans, they said, and thus, this having on a long term before than a hand-to-mouth basis.

However, he also urged continuation of CAB's exemption authority, "under which the independent airlines were allowed to start. It has the result of having, in effect, a 'one-way' ticket."

Johnston, who shared with O'Mahoney, who shared the exemption authority was awarded by Congress to be applied only to fixed-line operations.

"To eliminate this exemption, the need for great flexibility in the operating authority of nondevelopmental and contract carriers that should be made to take care of whatever immediate demand develops."

To illustrate his comparison that independent carrier still is "poorly insulated" to serve the demands of low-income travelers, Johnston presented this picture:

San Francisco and intensity has from operate five times as many passengers as each service in its territory.

But in air transportation, he said, more than twice as many passengers are not devoted to deluxe service compared to such by both scheduled and contract lines.

He figures the 1951, in passenger miles:

Continental	10 billion	Czech Airlines	1 billion
Eastern	11 billion	Swissair	1 billion
Northwest	12 billion	Swissair	1 billion
Trans World	13 billion	Swissair	1 billion

• **Orville Nelson,** president of Transcontinental Air Lines, emphasized that non-



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Esso furnishes more than the highest known quality of aviation fuels and lubricants to airlines and other aircraft operators. A variety of related and superior Esso services also helped to power the air routes of the world.

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AVIATION PRODUCTS

Airline Strikes

- ALPA threatens walkout over 8-hr. flight waiver.
- Action could paralyze American, UAL, TWA.

There of the nation's Big Four airlines faced the possibility of a pilot strike last week as the risk of Civil Aeronautics Board's decision to let airlines possibly the 8-hr. domestic flight (see page 10 by *William West* June 11, p. 10).

Strike ballots went out first to pilots of American Airlines from Air Line Pilots Assn. And, by the end of the week, were scheduled to be sent to United and Trans World Airlines pilots.

An alternative vote by pilots of all three lines presumably could halt flight operations of the three carriers.

AA Warning—G. M. Meyer, senior vice president of American, telegraphed F. I. O'Connor, chairman of AA's own to executive council of ALPA. "We take exception to your advising pilots of so-called violations of regulations in respect to flights hereby permitted by CAB because that certainly could erode safety and all other factors involved."

"Any pilot acting in your interest," Meyer warned, "will be considered as violating his obligations as an employee of American."

United indicated similar views.

If pilots of all three airlines voted to strike, ALPA and the necessity of a walkout could be frozen into action—within 24 hr.

ALPA Petition—Meanwhile, CAB had not come to any decision last week on ALPA's petition for reconsideration of the seven ruling.

The Board has permitted itself—could have to impeded itself with the technical aspects of the problem and it is recognized in permitting the move upon the record of these proceedings," the pilots' union said in its petition.

"No emergency exists that could possibly justify this hurry and it cannot occur by the Board."

ALPA charged that CAB by its action "condemned American Airlines" designed of the law," which the union maintains has been the case since AA first scheduled its DC-7 in country transcontinental service.

The Board's decision, ALPA said, would be the following questions:

- Is it CAB's intent that a pilot say 8 hr in scheduled number of hours continuously providing only that he was not be scheduled to fly more than 10 hr?

• What is the responsibility of the pilot after 10 continuous hours of flying in the event of an accident?

• If the exigencies of a particular flight require a landing enroute, is the pilot permitted by the 8-hr. or the 10-hr. agreement?

• If a pilot, after two hours enroute, experiences a mechanical difficulty necessitating a return to point of departure and is delivered there for lost hours, may he still deposit an hour scheduled 10-hr. flight as under the present 8 hr. rule?

• If the present regulation, equipment a requirement for a particular flight, may the pilot nevertheless depart on a 10-hr. flight?

• Is there any limit to the number of hours a pilot may be required to remain continuously on duty or fly as long as he is scheduled for less than 10 hr.?

• Is there any limit to the number of landings a pilot may make enroute as long as the flight is normally scheduled to be landing?

Meanwhile, ALPA was preparing a bill to be introduced in Congress limiting flight times for domestic pilots to 8 hr. Extended schedules—before of the report for a report of the regulations—prompted American to extend its 7 hr. 15 min. New York Los Angeles schedule to 8 hr. 15 min. American also put into service a third roundtrip DC-7 flight between New York and Los Angeles. Beginning July 1, AA will provide roundtrip DC-7 service between Washington, D. C. and Los Angeles.

TWA, through Super Constellation flights, would meet to round, was expected to draw off some of the business lost to American's DC-7 service before the waiver went into effect.

During the first few days of operation, TWA said it was looking for the roundtrip flight in times varying from 8 hr. 16 min. to 8 hr. 51 min.

United has one DC-7 roundtrip flight scheduled and has no more date plans for extending it. UAL also is operating one DC-7 roundtrip flight from San Francisco to New York.

'Champagne' Flights

Los Angeles—Western Air Lines' champagne and caviar service on its DC-6B California flight has gained with popularity that WIAL has doubled the trip from Los Angeles to San Francisco, Portland and Seattle-Tacoma.

The luxury flights were inaugurated approximately a month ago (Aviation News June 7, p. 13-14) to compete with Stratosphere service offered by United Air Lines on the same route.

In addition to the flight leaving Los Angeles International Airport nightly, the airline now has a mid-day trip to which parties enjoy the same champagne service.



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C. G. Jones, Salary Personnel Department

GOODYEAR AIRCRAFT CORPORATION
AKRON 15, OHIO

By David R. C. Brainer



The battle of TACAN vs. VOR/DME has resulted in an Air Coordinating Committee opinion that whenever the system of navigation the United States is to use, it must, among other things, be accurate to about one degree in all 360 sectors to an altitude of 60,000 ft. This is quite an order.

Few people other than pilots and traffic controllers fully appreciate the importance of accurate radio courses. Except for normal clearance agreements and operations, existing aids can be used with fair confidence that they are correct. When the war in air transportation could not have reached a recent state.

Accuracy of congressional rolls at low altitudes is not particularly surprising once they are checked the way we're doing: nothing appears wrong. But what about altitude accuracy? Until recently, of course, there was such a scarcity of rolls at the higher levels that it really didn't matter whether an "orange" even existed. But this day is new.

Fire Agency—As the AOC has recognized, we now need permission up high as we are going to act this is another matter.

Having many flaws, criticized violent government agencies for employees is a hope remains to point to a well. See one. CAN's Attorney Flight spectrum, only group charged with determining the right to access a the self, is a bipartisan organization. One political reason for this is the self is headed by honest to goodness pilots. The chief, Art Jara, one of the true visionaries of the world, and his deputy Ed Roper.

It certainly is true that ground monitoring devices, geoproprietary designs and electronic engineering calculations do a fine job of keeping radio currents on to tolerance. But the only solid gold proof that these courses remain useful to their charged audience comes from a flight clerk.

West Wind—Until a few years ago, flight checking was no particular problem. Jenks, or one of his associates, simply climbed into a DC-900 with recording devices and checked the scenery. While the safety of CAA's fleet of DC-9s and Bombardiers is not in question, it is likely it is going to be a safer next step to comply with ACI's 68,806

Actually this absolute restriction of APT means that every applicant from higher than 25,000 ft is taking an absolutely uncharted shot. Just because radio is OK up to that height is no guarantee that it is in the same 0.0001 as 40,000. Except for scattered data by military accident, however, proper recording instruments, there is no data on the condition of usage in the entire of ACC's airspace.

Tools for jobs—It is difficult to fathom the lack of modern airplanes at CNA. Besides not being able to do the job in the first place, any state in the world will tell you that it is uneconomical to operate obsolete aircraft. A sizable half of CNA's fleet of 30-year-old planes could be eliminated by acquisition of a few modern ones. For safety and efficiency, it is imperative that the aircraft be checked at altitudes at which they are being used.

The simulation is a tight shack of a VOR system since it leaves no ACC-3 and periodic checks of 3 to 4 hours, and we still don't know its current above 10000 ft. With some 250,000 miles of LF and VHF a day to cover, it doesn't make much backlogging to show that a modern automated system would pay off. If the new ACC directives is to not keep more than just paper talk, somebody had better consider getting someone back to do the job.

AVIATION WEEK—JUNE 28, 1965

[illegible]

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LETTERS

Shock & Vibration

In your *Letters* page, Mr. E. A. Paul of Northrup Inc. Mr. Warren Gehl of Burt Corp. have discussed advantages and disadvantages of vibration isolation.

Mr. Paul has stated that vibration isolation may do more harm than good if we remember shock and resonance affect the control system, or reflect that vibration isolation use, of course, involves the isolating shock, and should not be used where shock is present. I fully agree, and I believe Mr. Gehl's confidence, clearly, Mr. Paul's statement.

In military aircraft, both vibration and shock are present.

We have found that not only do vibration isolators amplify shock, but that all modified shock isolators which we have tested . . . the simplest shock (that does not lead to destruction in MIL-E-1221A) is isolation, most shock isolators exhibit undesirable resonance effects somewhere between 20 and 40 cps. However, the shock isolator does not amplify shock nearly as much as vibration isolators amplify shock, but obviously is needed in a "load-and-isolation" isolator.

We are presently faced with the choice of either utilizing good vibration isolators at the expense of large shock amplification or of obtaining mediocre vibration isolators with only slight shock amplification. It should be noted that the isolator manufacturer has not and is not at fault, the error allowed for the make of the isolator is often sufficient to allow even an ideal isolator to attenuate shock.

In this letter, as well as in most specific articles, the words "shock" and "vibration" have been used loosely. I would be a definite critic, not of an actual article, but the gross differences have to do with the difference between transient impulses and steady state oscillation.

However, all research of actual behavior of an aircraft structure reveal increases in its anti-laggy nature. This confirms the characteristics of both shock and vibration. I wonder if your readers can suggest a more satisfactory method of determining the terms shock and vibration, both as applied to airborne flight systems and to delivery test techniques? I believe that such efforts would be helpful to the entire industry.

M. R. SELLON, Supervisor
Reliability Design Group
General Motors Aircraft
P. O. Box 798
Detroit, Mich.

Breadboard Model!

I have noticed the comment by John S. Crawford in your May 24 *Aircraft* Warren on page 96 under the title, "Are You Ready?"

Regarding his opinion, "Where you find another member even outlasts anything only 100 pounds and having good adaptability, that can be produced as cheaply as completely qualified labor," I

wish to remark that Mr. Crawford, I am sure, refers only to the "breadboard" model. He will agree, no doubt, that the present technology has been in the development laboratory for over 20 years at a cost estimated as follows:

1. Tool equipment (20 yr.) \$50,000
2. Development of basic screw system (25 yr.) 8,000
3. Experimentation and redesign of screw and wing system (12 yr.) 12,000
4. Fabrication of screw system (addition of velocity feed back) (15 yr.) 45,000
5. Government furnished drawings: Additional refinement of screw and storage system (4 yr.) 50,000
6. Environmental control equipment, temperature, pressure, acceleration 25,000
7. Personnel for production of mechanical, electrical, test equipment facilities 21,000
8. Miscellaneous costs (20 yr.) 180,000

Total cost \$584,000. It should be noted that the resulting product is extremely fragile, has an average useful life cycle of two hours and is broken off, must be replaced every four hours during the duty cycle. Its a poor example of a "one shot" of 1,500 to 10,000, costs \$2,000 per lb., has a maximum in service of only 10 minutes due to fatigue (most is not repairable), requires 75 cubic feet of space in the operating area, requires and requires only a minor to Mr. Crawford's question, I should like to suggest the Stephens-Dugdale Co. Inc.

Raymond Kays
Director of Engineering
Stephens-Dugdale Co. Inc.
2000 N. Main St.
Riverside, Calif.

Support for Soaring

From editorial May 1, "We Can't Afford a Soaring Team!" is badly appreciated by all of us who are interested in the possibilities of gliding and soaring in a wholesome and sporty and a possible aviation education medium.

You may know that the Soaring Society has long sought national and federal recognition from the aviation industry and has often requested why the aviation industry has been allowed to provide the only real support for model aviation. Aviation is one of the few industries that has the possible advantage of capturing aviation interests to its own benefit, both at personal and customer and customer relationship for the future. Almost every aviation industry has spent millions of dollars in doing so.

The aviation industry could "lend a hand" to support for a lot of money each year that is spent by the non-aviation industry, in an example, on a public radio or television program. It seems that the industry is

reluctant to wait until the study has prepared himself for a mission and that the industry and universities in competition with all the other industries to try to win the future for a certain or certain. It is my hope that they do not plan a little later about and will remain in the path during the long-term steps of his aviation, which can produce would be to gain and success would be much later.

A little support for modeling and gliding and soaring might very well eliminate the need for a great deal of the aviation and military radio and space.

Joe D. Garvey
1375 Laurel Road
Dallas 9, Tex.

Missiles & Tubes

The fourth year of our RTMA (Radio Tube Manufacturers Association) Survey will be completed in about three months. I would like to include as our next year the article, "Missile Launch New Horizons Tubes", in the May 22 *Aircraft* Warren. Do you have reports of this article available?

I, too, am much would 6,000 copies sent. Lewis M. Charnick, Chairman
Electronic Applications Committee
(Reliability)
2100 Canby Street, Area 100, Corp.
Beverly Hills—Box 114
Cincinnati 15, Ohio

Praise

Please accept our belated appreciation of the great way in which George Charnick and Associates' Warren handled the recent story on our expansion.

As Harvco, Director of Public Relations, American Co.,
Low Field
Dallas 9, Tex.

The steps of Associates' Warren which was forwarded to us was covered only in full.

Not only did it provide a good source of information, but also an early source of current information on the U.S. Navy at last.

On behalf of the members of our group, I should like to thank you for the prompt assistance which you have given to the matter.

J. G. Thomas
Mr. J. G. Thomas
New York
New York
New York
New York

We enjoyed making the excellent article by George Charnick on our Denver opening. He really did a job in getting a whole lot of facts in a few lines, then in putting them together into a most readable article.

E. M. Janssen,
Director of Publicity
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Since December 1950, Allison has conducted extensive flight tests with its own Turbo-Liner to exploit the advantages inherent in Turbo-Prop power for transport service. In addition, the Navy is accumulating experience in the Douglas A2D Skyshark and the Convair R3Y Tradewind—also powered by Allison Turbo-Prop engines driving Aeroproducts propellers.

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